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modern plastics

SEPTEMBER 1940

VOLUME 18 NUMBER 1

NEXT MONTH— THE WINNERS!

Its fifth birthday and, my, how it has grown! Modern Plastics Annual Competition for 1940 records a remarkable advance in the scope of the plastics industry from the point of quantity production, quality and variety—in the huge volume of striking entries. The October number will contain a complete pictorial and factual presentation of this advance as evidenced by top award winners and honorable mentions in this year's Competition. All entries will be on exhibit after September 15th, Suite 303, Chanin Building, 122 East 42nd St., New York, and readers and friends are cordially invited to see for themselves!

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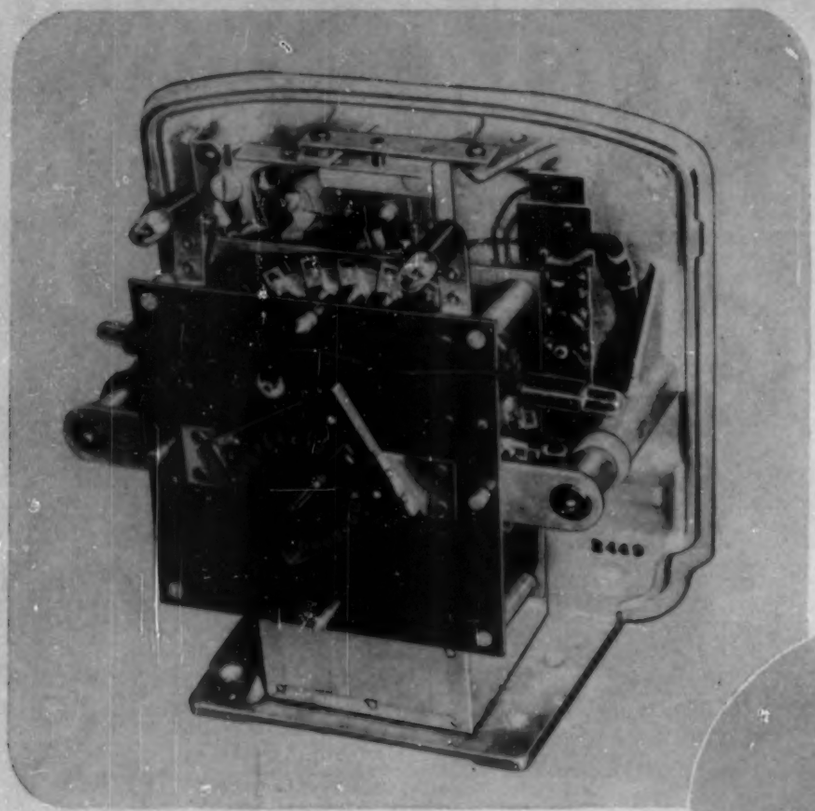

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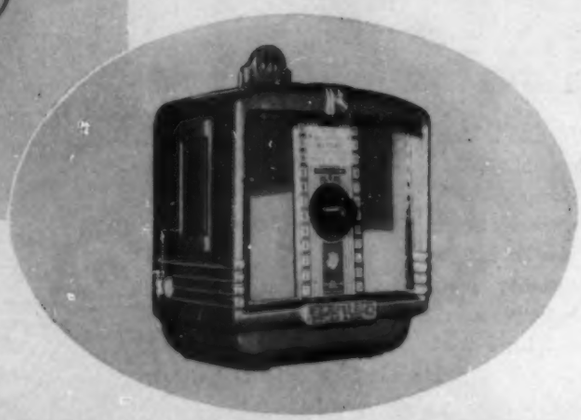

Interior and exterior views of coin-operated control for phonographs, manufactured by J. H. Keeney & Co., Chicago, Ill.

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MODERN PLASTICS
WILLIAM T. CRUSE, Editor

SEPTEMBER 1940 VOLUME 18 NUMBER 1

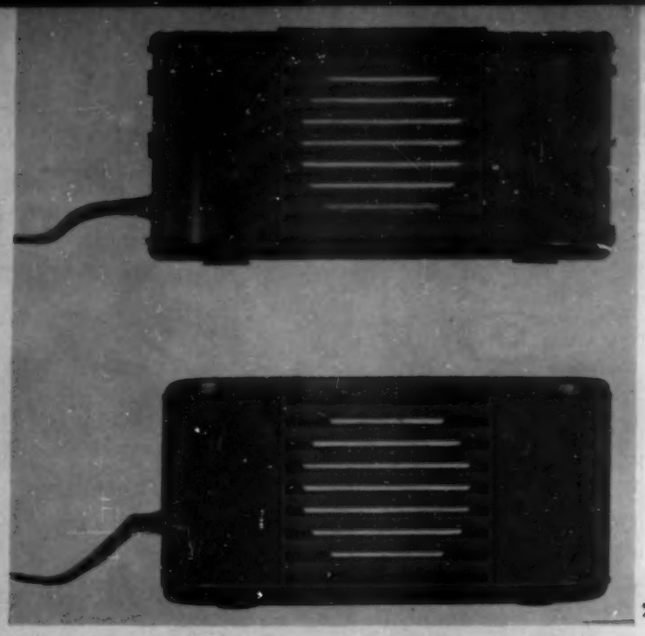
Compact RCA Victor Personal radio has an injection molded polystyrene case with a built-in antenna housed within the lid. Inset shows top and bottom parts on the sprue as it comes from the mold

On the air

Plastics are ideally suited for large scale production of intricately formed small radios and structural parts

TABLE model radios led radio production in 1939 by a wide margin. Approximately 5,800,000 of these sets represented sixty-six percent of all radios produced in the United States last year. This impressive production is neither a coincidence nor a natural phenomenon, but rather it is the result of a combination of circumstances not least important of which has been the radio industry's increasing use of plastics. There is probably no other business which has used plastics more advantageously or more extensively.

Attracted by their electrical properties, by their physical characteristics, by their styling potentialities, by their mass production possibilities and with an eagle eye on cost the radio engineer has turned to plastics. In 1940 the adoption has been even more extensive. Comparatively considered, the low cost of producing plastic radio cabinets on a mass production scale, not to mention the other integral chasis parts, has enabled radio manufacturers to offer the consumer sets at prices which would otherwise be impossible.



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2—*Slung over this equestrienne's shoulder (left) is Philco's portable set. Case is injection molded of Tenite II in two separate parts (right) and covered with harmonizing leather on either side of the grille.* **3**—*Remler's Topper model has a smartly styled, mottled phenolic cabinet with a light, easy-to-read dial.* **4**—*Incorporating the louvers into the decorative motif, this RCA Victor set of molded phenolic conservatively combines function with modern lines.* **5**—*Complete with 4 tubes, the camera-like Candid measures 8 1/4 in. by 5 in. by 4 1/4 in. and weighs 4 1/2 lbs. Molded ivory controls are set into the side.* **6**—*The sleek Serenada combination can be hooked up for records or airwaves. Both are Sonora's latest models, housed in Durez or Insurok.* **7**—*A lightweight, tough, injection molded Tenite case, partially covered in leather houses the Sentinel portable by Electrical Research Laboratories*

4

Plastic materials have contributed immeasurably to the underlying economics which have broadened the radio market by enabling table models to be sold within the reach of very modest pocketbooks.

In the cabinet and console field they have also been extensively used. Here, however, the applications have been primarily decorative except, of course, for the wide functional use for knobs.

Radio cabinets of molded phenolics have led the procession. They have been followed in volume by those molded from urea with the cast phenolic types being the third major source. This order of importance is readily accounted for by the respective prices which prevail. Until the 1940 season arrived all radio cabinets were compression molded. This year for the first time in the history of the plastics industry, injection molded thermoplastic cabinets are being supplied for radios. Materials of this type have generally been regarded as being too heat-sensitive for the purpose. While some improvements have been made in this respect, this development has been stimulated by the demand for housings for these small portable battery operated sets. Even though they do develop heat it isn't either as extensive or as intensive as in an A. C. or D. C. operated radio. The non-brittle characteristics of some of the thermoplastic materials have contributed to their success in being selected for these small units. They must withstand considerable abuse, as they are carried about much after the fashion of a camera. They are liable to go horseback riding, to the beach, to the mountains, or sailing without notice. They must be prepared for rough and ready service.

The development is both important and interesting. It may be the significant forerunner of further developments to come in this relatively new art. Possibly we shall soon see large radios constructed from injection molded sections.

RCA is manufacturing a "personal radio" which is one of the small portable battery-operated kind (Fig. 1). While the chassis of the set is enclosed within a metal container the lid is of plastics. And for a very good reason. The lid in this set does more than the perfunctory job of protecting the set when it isn't being operated, functioning as both the switch which turns the radio on, and the antenna housing when opened. Where it has been practice to depend on an outside aerial this set is constructed to work with this small loop. The two-piece lid, is injection molded from polystyrene on one sprue. Without a plastic of such exceptionally stable dimensional qualifications to double-duty as an antenna housing, a miniature radio, compact as this set is, would have been difficult—if not impossible—to manufacture. The rough, pebbly finish of the lid is rich in appearance, will not easily scratch or mar and provides a firm grip.

Philco Radio and Television Co. is manufacturing a small portable model which uses an injection molded cabinet (Fig. 2). The material selected for use is cellulose acetate butyrate, which, in their opinion, would have the greatest shock resistance of the thermoplastics and at the same time would maintain its dimensions regardless of the climatic conditions to be encountered. In addition, with this material they could obtain any desired color. They have used as an adjunct to the plastic a wide strip of leather running completely around each end to serve as decoration and better grip. Fifty feet of aerial for the set is incorporated in the shoulder strap. Both the station selector and the volume control dial are injection molded from the same material. This set, one of the first of its kind, has been extremely well received and the manufacturer reports they are having a difficult time meeting the demand.

Electrical Research Laboratories manufactures a small portable, their model 227-P, which in many respects resembles a camera (Fig. 7). They have taken advantage of the economies of injection molding and the toughness of cellulosic materials in producing the container for this small individualized model.

The present radio season has witnessed several impressive innovations. The public's imagination and attention has been captured by the small portable battery operated radios which are being shown throughout the country. Through a nation's desire to keep abreast of the cataclysmic international news that is originating abroad, demands for sets of this type have been stimulated. Today the man in the street will have news wherever he goes.

Besides the injection molded, compression models

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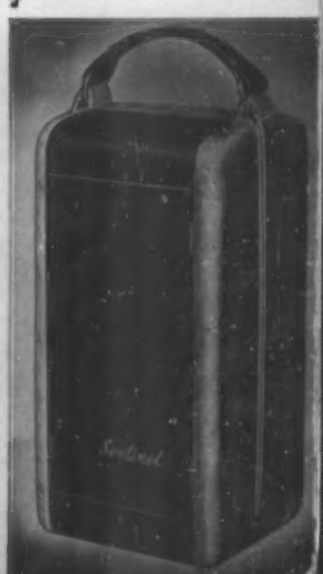

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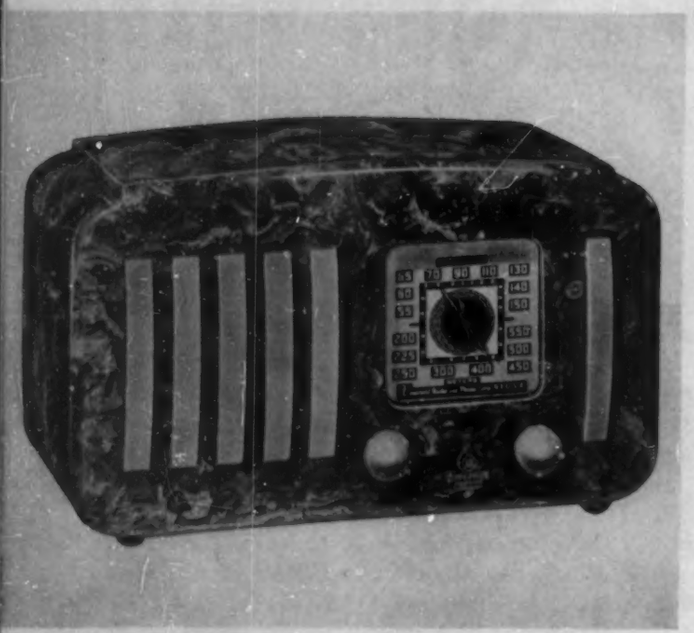

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are among the sets which are filling this need. One offered by Sonora Radio and Television Corp.—the "Candid" model (Fig. 5)—is in the vanguard of its class. The Sonora engineers encountered an extremely interesting problem when they undertook the designing of the "Candid," and were, in a fashion, feeling a new market. They concluded that they would rely upon established methods and materials with which they were familiar, insofar as that was practical. Accordingly, they determined to use a phenolic housing. They planned to mold the cabinet in two halves, designed to allow for the antenna to be contained within. The fresh problem of what to do with the batteries was settled by incorporating within one side of the cabinet partitions that would serve to hold them in place. The whole unit is mounted on its chassis by using only two speed assembly screws. Testifying to their success is the way the set withstands a severe critical physical test to which it is subjected—when dropped from a height of from three to four feet several times it does not fail. In addition they have devised a tropical test whereby the set is placed in a humidity chamber for twelve hours at 212 deg. F. and here again no failures are reported. By taking advantage of the bright colors, obtainable in the thermoplastic materials, the wave length selector and the volume control are molded from them, lending a colorful touch.

Sonora is also producing a small combination A. C. or D.C. portable radio phonograph (Fig. 6)—one of the few of its kind on the market. It is molded of phenolic and urea plastics, and designed to occupy a minimum of space without loss of efficiency.

The phenolic molding materials occupy the position of prominence in the table model field because of their relatively low power loss, high dielectric strength, their mechanical stability, their heat resistance favorable impact, low cold flow and economical cost.

While all of these propitious qualities are inherent in this type of material and while considerable quantities of cabinets have been molded from phenol-formaldehyde powders, still each design requires its own engineering. There are no established inviolate rules, for instance, as to what constitutes the optimum minimum

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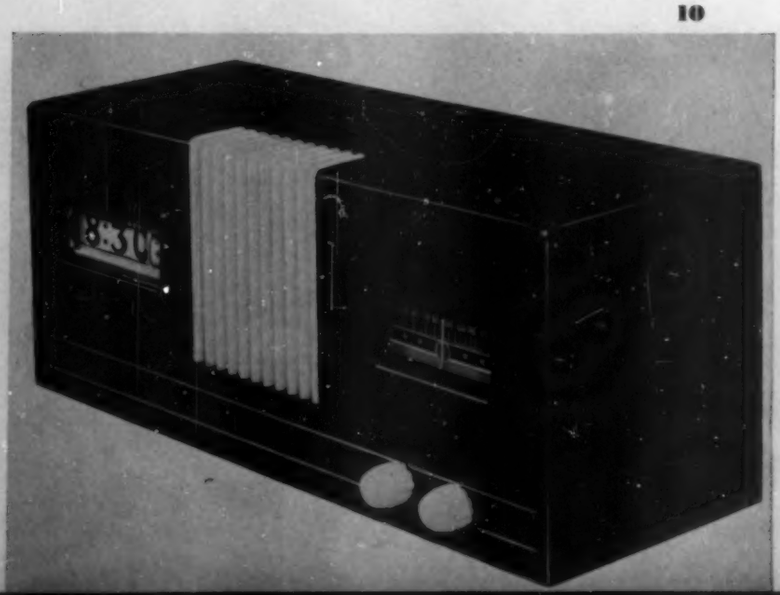

8—Economically molded of phenolic, Zenith's streamlined set is made available in light pastels by enameling the Durez cabinet. 9—Emerson uses a wide variety of variegated colors for this model housed in Monsanto cast phenolic. 10—Radio-Numeral clock by Anthony Martinek combines an efficient receiver with a synchronized timepiece in a Catalin housing. Striking color contrasts and simple lines distinguish the set

tolerable wall thickness. Prudent quantity purchasers of cabinets respect the judgment of a molder. Fortunately there are several that have specialized in this field. Contributing toward standardization in structural cabinet design is a ruling of the Board of Fire Underwriters which requires for their approval as follows: (1) below the chassis line a wall of at least 1/8 in. in thickness; (2) above, not less than 3/32 inch. Sets manufactured from this class of material have a wide selection of rich brown mottles from which to choose or they may rely upon the striking contrasts which may be achieved by using contrasting materials with lustrous blacks. A prominent radio designer had this to say respecting colors, "Our 'trade' preferred, if you please, first—mottled brown, not too light or too contrasting, second—ivory or black."

Many manufacturers whose markets demand colors specify the low cost phenolic cabinets; then by enameling, obtain the color required. Enamels made from oil-soluble phenolic resins have been found appropriate for this purpose as the surface has many of the characteristics of the cabinet itself. Radios' 1940 pageant of models includes many that have advantageously used molded phenolics. It is apparent that the designers and engineers have incorporated knowledge gained through preceding experience in achieving the advanced results apparent in these designs.

The Zenith Radio Co. have designed a smartly styled modernistic cabinet which they are manufacturing from a phenolic material (Fig. 8). They are enameling the cabinets in several light pastel shades, thus are availing themselves of the economy of using phenolic compounds and, at the same time, delivering light-colored sets for which there is a demand. This is a splendid example of a radio manufacturer who is taking advantage of the low cost phenolic materials and by additional processing, delivering sets of practically any required color.

The Emerson Radio and Phonograph Co. are large producers of table models and are currently manufacturing six sets in which they have advantageously used plastics of both phenolic and urea types as well as cast phenolic cabinets in meeting the requirements of their production. In studying the problem of producing these

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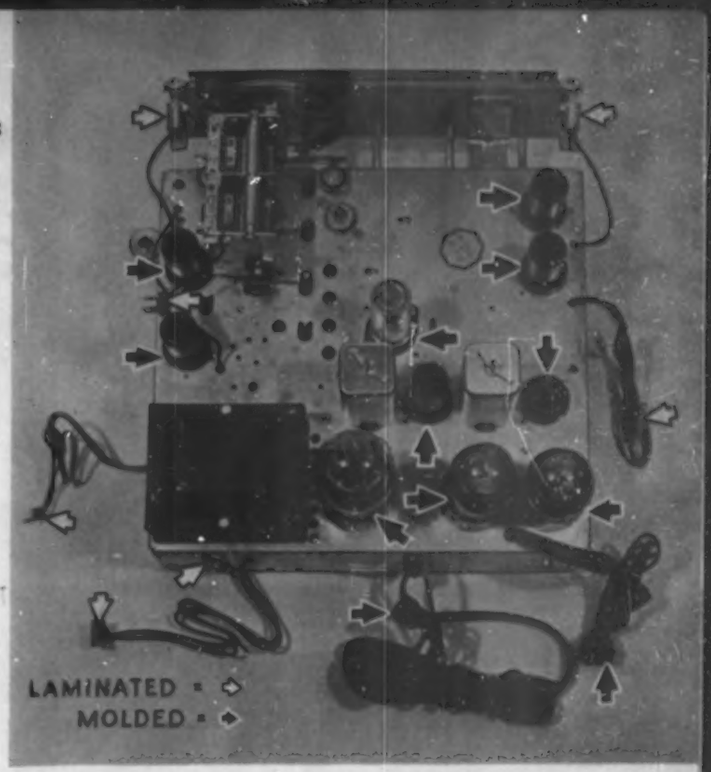

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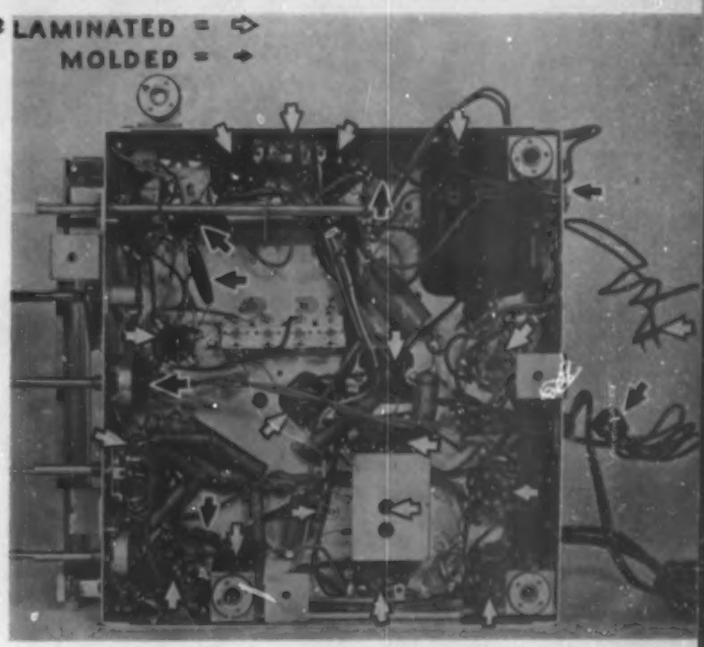

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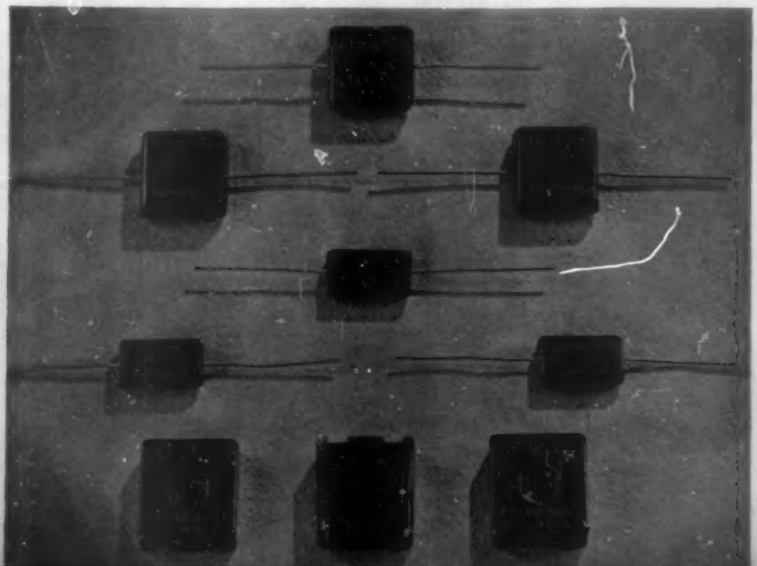
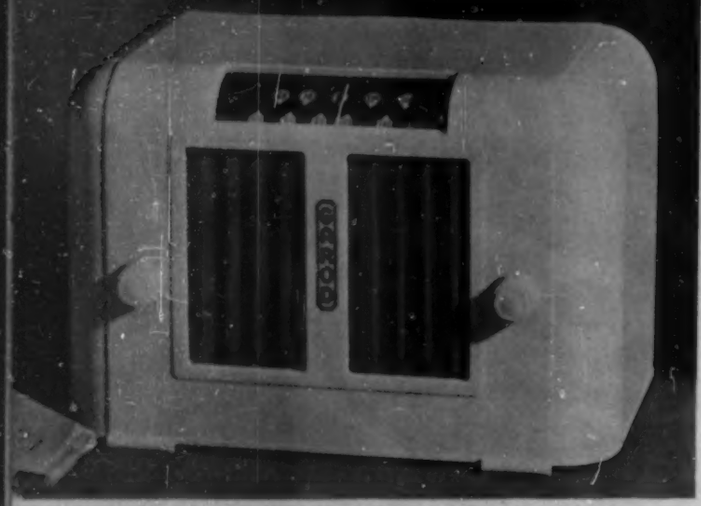


Vitally important for many tiny parts necessary to the smooth functioning of large as well as small radios, both molded and laminated plastics provide insulation and strength. **11**—*Mica and padder condensers at left are intricately molded of Bakelite.* **12-13**—*Top and bottom views respectively of an RCA radio now in production. Black and white arrows indicate 16 conventional molded parts and 23 pieces made from laminated stock*



14—Ivory Beetle is used for the cabinet of this newly designed Garod radio introduced for the 1941 market.
15—Farnsworth employs Plaskon for a portable model with corner louvers supplying a decorative note. These light colored urea cabinets, because of their translucent quality have a wide popular appeal

sets both large scale low cost production and style were important factors with which to be reckoned. In the brisk competition of this price market pennies tell a big story. Yes, fractions of cents often represent the difference between red or black ink. Emerson, one of the long established users of plastics, widely experienced in their results, believes that these materials pave the radio highway to success. Mechanically, these cabinets give a minimum amount of trouble both in manufacturing and after they are in the ultimate purchasers hands. When they arrive at the Emerson plant they are ready to be assembled. The molds are so constructed and so polished as to reduce the finishing to a negligible factor. The well adapted styles are represented in the varied range of 1940 models.

The Remler Co. are in production on a unit which depends upon the simplicity of its lines for style (Fig. 3).

14 The dial is of the easily read light-face type with an arrow indicator. The cabinet is constructed in a manner to allow for either a four or five tube chassis. This company has the unique distinction of being both a custom molder and a radio manufacturer.

RCA's table model 15X is a good example (Fig. 4). The cabinet is a modern continental type incorporating an angle vision dial. This longitudinal dial, located at the top of the cabinet toward the front, resembles in many respects the dials to be found on the larger more expensive sets which this company makes. The color of the material is a variegated walnut.

Perhaps one of the most unusual radios of the year is the Sonora radio bedlamp combination. (Pictured in MODERN PLASTICS, Jan. 1940, p. 37.) Here within a small housing that may be attached to the head of a bedstead by clever arrangement both a lamp and a radio have been incorporated. Phenolic plastics were selected to resist the heat generated by both the incandescent lamp and the radio tubes. Moreover the material had to have the structural strength to withstand the constant weight strain of supporting the radio chassis and the possibility of frequent "house-keeping" bumps. Thus far there have been few failures reported from the field.

15 Silvertone, one of Sears Roebuck's small novelty sets (pictured in MODERN PLASTICS, March 1940, p. 31) is using a phenolic housing. The set, sturdily constructed, is intended to withstand hard service and its streamlined fluted contours bespeak its character.

No material lends more characteristic distinction to the cabinet of a radio set than the cast phenolic type. Because the materials by this method are cast or poured into molds, by using two or more colors an infinite variety of configurations is possible. Emerson in their 1941 model No. 375 has taken full advantage of the beautiful variegations which are available (Fig. 9). These sets are offered in Mexican onyx, blue onyx, Brazilian onyx and red onyx. While the manufacturing process of making cabinets by this method entails more operations through the increased finishing required, it is offset through the striking beauty of the results which are obtained. Basically the material is the same as that which is used in the conventional molding method; therefore, the same electrical properties are obtained. In some physical respects the molded cabinets differ from cast cabinets.

Among the more important advantages of using cast phenolics is the inexpensive cost of tooling. In manufacturing molds for casting, the extreme mechanical precision essential for compression molds is unnecessary. For this reason, use of cast resins make changing models less costly. A very recent strikingly designed, uniquely colored example is one being manufactured by Anthony Martinek (Fig. 10). The radio cabinet also houses a speedometer dial electric clock. Still another cast phenolic cabinet has been made by the Fada Radio & Electric Corp. with an easily read circular dial. By using colors of extremely different values, an interesting effect is attained.

Phenolic plastics as they are used in radio cabinets go a long way in telling their own story. While the material may not be recognized as such, all know that in the main whatever the composition may be it does a creditable job. Year in and year out, North, South, East or West, Winter or Summer the radio performs. Little consideration is given to the works within, unless perhaps a tube goes bad, then "off the air" attention is directed to the working mechanism. While phenolics have played an important role as a housing material they have been, since the beginning of wireless sound transmission, an essential material in the construction of the operating parts of all sets. Phenol has been used universally as the bonding agent in the manufacture of laminates, which because of their outstanding electrical properties and their stability have made them an important requirement in the construction of these intricate electrical instruments.

In one of the RCA models now in production there are in all 23 pieces made from laminated phenolic materials, not to mention 16 parts which are of conventional molded phenolic material (Figs. 12 & 13).

Of the small parts which are used phenolic molded mica and padder condenser accounted for a large number (see Fig. 11). In the smaller sets which are now being made chassis parts made from these types of materials and this class of moldings are even more important, if that is conceivable. Without plastics it would be impossible otherwise to construct and produce in quantities the small watch-like parts required.

In answering the demands of the style conscious radio buying public the designers have not overlooked nor failed to explore all possible plastics. In the urea-formaldehydes they have found plastics possessing the general characteristics of the phenolic types and at the same time offering in addition whatever shade of color is desired with any selected degree of translucency. Among the new 1940 models there are innumerable examples of sets made from these materials which have taken full advantage of their appealing color properties particularly the delicate ivory translucent models.

In adapting the urea materials to radio cabinets it has been necessary to take into account the characteristics of the material. Obviously with light colors it has been necessary to design properly at points of direct interior light and heat exposure. It has also been important to make correct shrinkage allowances. Manufacturers who have abided by the suggestions of either raw material manufacturers or their molders have encountered no difficulty.

The Garod Radio Corp. is meeting with marked success in one of their units having a urea cabinet (Fig. 14). Straight vertical fluted speaker lines, knobs balanced on either side for tuning and for volume give the set a dignified appearance. The horizontal contrasting colored dial is well located.

The Farnsworth organization produces several models which are significant examples where urea cabinets have been used. One of them is interesting in that it incorporates a molded carrying handle of the same type of material. (Pictured in MODERN PLASTICS, Feb. 1940, p. 37.) One of the other cabinets has a handle of a contrasting colored material (Fig. 15).

The General Electric Co. has two sets among the many which they make which use urea plastics to excellent advantage. (Pictured in MODERN PLASTICS, March 1940, p. 31.) The designs of the cabinets themselves are interesting, especially one of them which has as a station selector a disk molded from the same material rotating on an axis parallel to the front of the housing. Only a small portion is exposed at one time. The volume is controlled by an (*Please turn to page 86*)

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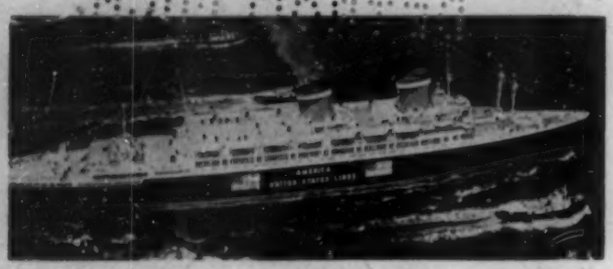
17

16—Available in either walnut or ivory Textolite, this General Electric table model has a 5-in. speaker, built-in antenna and illuminated dial. Utter simplicity of the housing is characteristic of this year's sets. 17—RCA's New Yorker, in ivory, black and brown plastic, is trimmed with a contrasting colored triple band running around the base. Edge-lighted dial is set at a convenient angle for full vision

Luxury liner

Meeting strict demands plastics prove serviceable and smart for shipboard décor



THE S.S. *America*, largest passenger liner ever constructed in the United States uses plastics for decorative effects in its distinctive interiors. With a displacement tonnage of 35,440, this is the first of 500 merchant vessels to be constructed during the next ten years, according to a plan laid down by the United States Maritime Commission. Barred by the Neutrality Act from the North Atlantic trade, for which she was designed, this sumptuous modern steamship (shown above) will inaugurate a fortnightly schedule of vacation voyages to neutral ports in the West Indies.

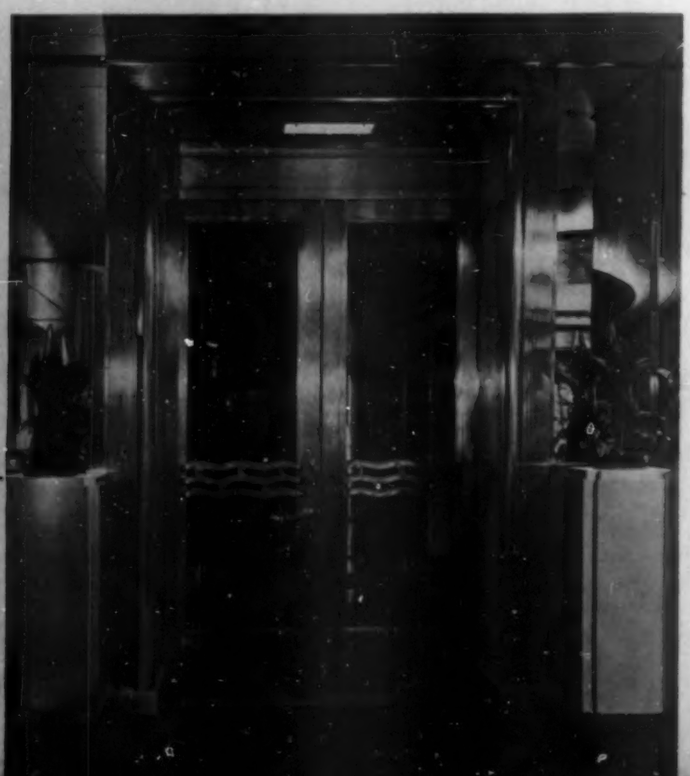
The new maritime building code of stringent safety requirements imposed many structural restrictions, necessitating the use of new materials and new methods. Although at first it seemed as if the search for products that would conform to the new law would imply limitations in effects, quite the contrary proved to be true. The discovery of new and more interesting materials, among them plastics, helped to give the ship the freshness of feeling and lack of stylism that is its greatest charm. More than 90 percent of the vessel is constructed of non-inflammable materials.

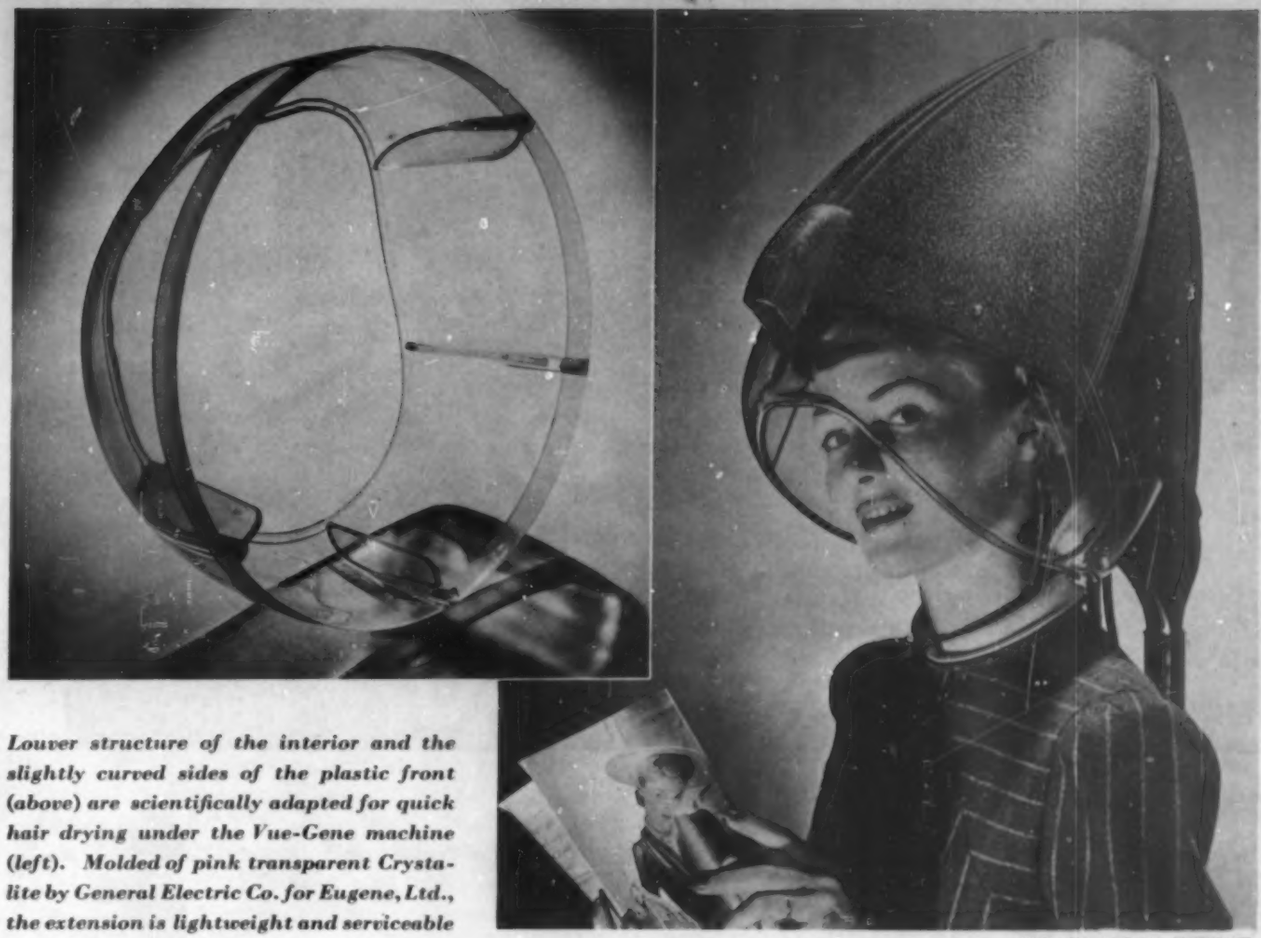
In many of the public rooms, and there are 23 of them on the ship, laminated plastics—easily cleaned, cigaret and alcohol-proof—are used for the table tops. Colors and designs vary to harmonize with the decorative scheme of each room. This same type of wear-resistant material was also employed to surface dressers and bureaus in the staterooms, cabins and suites.

The two main entrances to the gay and sparkling ballroom, with its color scheme of white, silver, light gray and tones of soft rich red, are flanked by sculptured pieces formed of cast phenolic in a pale grayish-lavender tint. Exemplifying a stylized fruit motif these cast resin sculptures stand about 22 in. high and are supported on white pedestals (below, at right).

Directly off the ballroom is a (*Please turn to page 96*)

Panels of carved Lucite rods, at left, complement the indirect lighting in one of the cocktail lounges. Stylized fruit sculptures designed by Breading Furst and cast in Marblette by Art Plastic Co. flank either side of the ballroom entrance shown at right. Fans with Micarta blades, and Formica table tops are found throughout the ship





Louver structure of the interior and the slightly curved sides of the plastic front (above) are scientifically adapted for quick hair drying under the Vue-Gene machine (left). Molded of pink transparent Crystalite by General Electric Co. for Eugene, Ltd., the extension is lightweight and serviceable

PHOTO, COPYRIGHT 1940, EUGENE, LTD.

Halo-hood dryer

A large transparent molded acrylic extension allows all-around vision

TWENTY-SIX ounces of clear acrylic resin—in a large molded piece—bring a new freedom to the women's world. A completely new transparent front for the Vue-Gene hair dryer, manufactured by Eugene, Ltd., has changed the dreaded session of confinement under a dark, gloomy dryer into a comparatively comfortable period. Admitting light and permitting unobstructed vision on all sides, the clear plastic front creates an effect of cleanliness and ease.

Probably one of the largest thermoplastic pieces ever molded in this country, the Vue-Gene plastic front is made of transparent plastic in shades that will harmonize with the interior decoration of any shop. Tinted a delicate pink, the material blends well with the gray, black, brown or blue of the rest of the machine and at the same time is flattering to the complexion.

An important factor in accomplishing the job was the willingness of the customer to permit necessary changes in the design. This facilitated the work of production and made it possible to turn out a unit that possessed the ultimate in appearance and function. When material and design problems had been settled, a carefully engineered mold allowed quick heating, uniform cooling and sufficient density that eliminated bubbles in the finished part.

In the original model, two of the louvers or baffles extended above the rim of the piece, since it was the customer's belief that only this arrangement could permit proper circulation of the air in the completed assembly of the hair dryer. Two mounting posts also extended above the rim and added to the impracticability of the molding. Appre- (*Please turn to page 98*)

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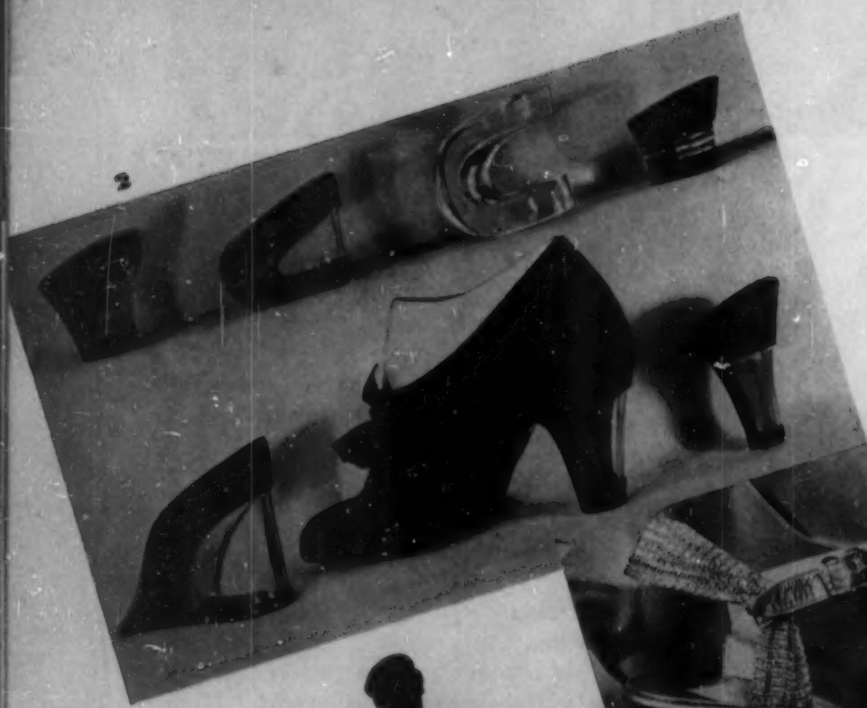

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plastic modes

DESPITE war and strife, talk of battleships, airplanes and guns, and the conquering of nations by subversive activity, fashions are still news. As a matter of record, here in the United States, the styling, designing and making of women's wearing apparel has become a headline snatcher. The reason, of course, is German-conquered Paris. Paris, the international font of fashion, has fallen with the result that American designers and manufacturers are engaged in a frantic effort to take over the reins. With all of our fine designers and new materials, there is no reason why American originators cannot continue to dress the women of this nation. The foreign couturier catered to the wealthy, with original models, while our manufacturers have given style and good design to the masses, with the result that the women of this country, as a whole, have a reputation of being the best dressed in all the world.

Plastics are becoming increasingly popular as an integral part of feminine wearing apparel. Supplanting metal, glass, leather, wood and certain enameled materials, they play a large part in the style modes for fall wear. Shoes, for example, are attracting considerable attention because of the varied and novel uses of plastics. Apparently shankless and heeless models have these parts made of clear acrylic plastics. Uppers of some designs are made of vinyl resin sheeting.

1—Sparklingly new and different are these shoes, belt and bracelet fashioned of a material made from

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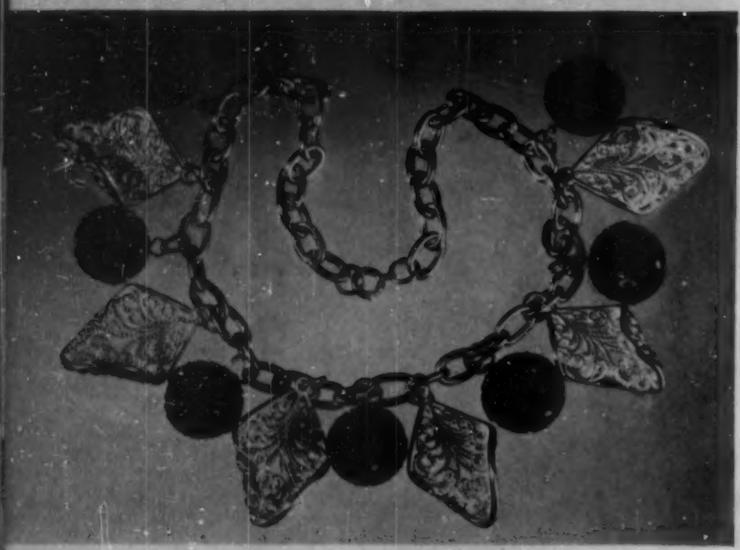
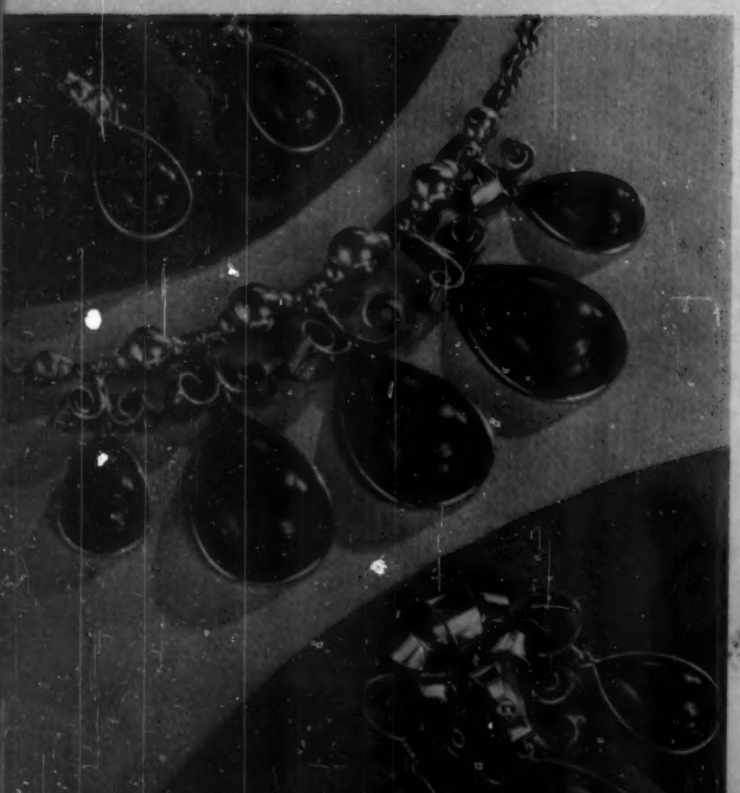




8 Cotacord, a textile cord coated with a Monsanto cellulose plastic. The material is woven and crocheted into intricate designs giving the effect of scintillating jewels. The plastic coating, in addition to adding color and luster, makes the cord tough, strong and water-resistant. The cord is made by Freydberg Bros., and the belt and shoes are from the House of Glass. **2**—Heels of Plexiglas made by Kenneth B. Keys vary in size and shape. **3**—Catalin Prystal heels in a variety of colors are also finding favor in the fall showings. The gay colors of this plastic are somewhat of a departure from the crystal-clear materials. **4**—A new version of the shankless shoe is presented by Schwartz and Benjamin in a variety of fall colors with a shank of clear Lucite that becomes "invisible" when the shoe is on the foot. **6**—Clear heeled Plexiglas evening slipper has an upper of silk mesh that is chemically treated and dyed to order. This model is designed by Natalie Carpenter and fabricated by Brooklyn Wood Heel Co. **5**—New forms in molded plastic jewels are Coltstones with their wide variety of

9 sizes, shapes in transparent and mottled forms as well as striated and opaque types. These gems are made of combinations of various plastics including a new form of Plaskon, Lucite and Durez. These stones are being introduced at a time when manufacturers in this country are no longer able to obtain the large quantities of glass and composition products manufactured in Europe, particularly Czechoslovakia, on which they had been almost wholly dependent. The jewels are readily adaptable to tie clips, bracelets, rings, brooches, shirt studs, cuff links, to mention but a few of their potential uses. **7**—Handbags and shoes of Vinylite—a barrel purse employs the clear plastic lined with a pinky beige silk and piped with black suede to match the top frame. The large pouch bag is blue, perforated and lined, and has a matching blue suede frame and handle and gold clasp. The handsome black suede envelope number has the clear vinyl plastic in the accordion insets. The shirred pouch model is of green vinyl resin

10 combined with dark green suede. The black suede pumps have a perky bow trim and toes covered with the clear, transparent material. **8**—Plastics really go to the head, too, in more than one way. A visor type turban of black doeskin has an accenting note of trim in the clear Lucite ornament gracing the side. Complementing this Florence Reichman hat is a single strand necklace of large marble-like beads (Jos. H. Meyer Bros.) of matching plastic in clear and translucent form. **9**—Much of the plastic jewelry for the autumn season is attractive and easy to wear. The necklace of Lumarith has links and leaves plated with 14 K. gold. The filigree beads, molded by Commonwealth Plastics, are polished black, so that the effect is of sparkling jet. **10**—Pear-shaped globules of Tenite form Joseff's ensemble—necklace, lapel pin and earrings. Graded in size and set in a gold-colored rim, the plastic drops are mounted on thin leaf-patterned metal pieces. All are molded by Jimmie Gillum and are available in darker shades for fall.

Plastics used as clear and translucent decorative trim are an important style note for the coming season.

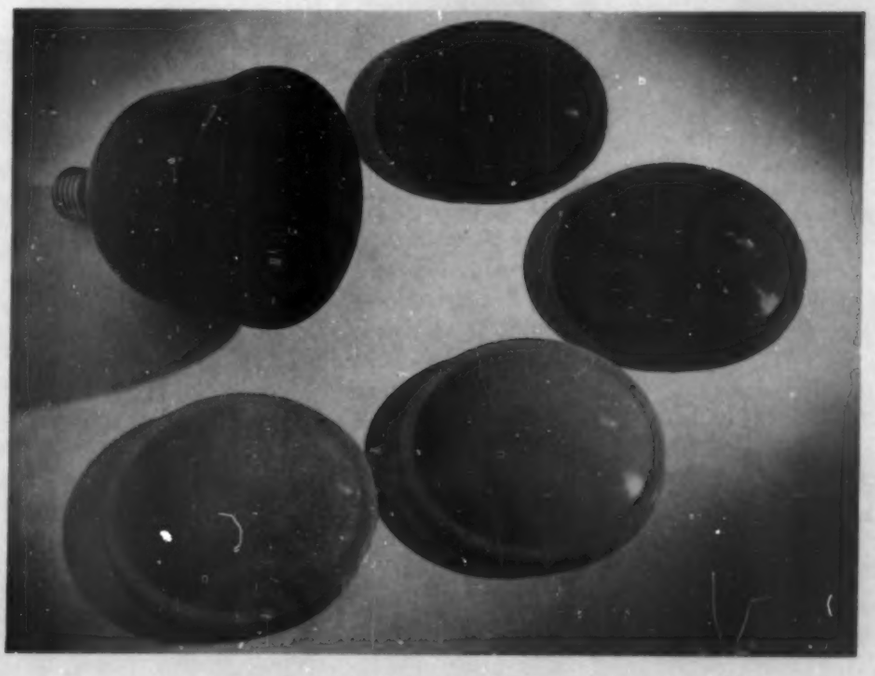
Light in the darkroom

A shock- and corrosion-proof housing and separate colored plastic filters insure safe illumination

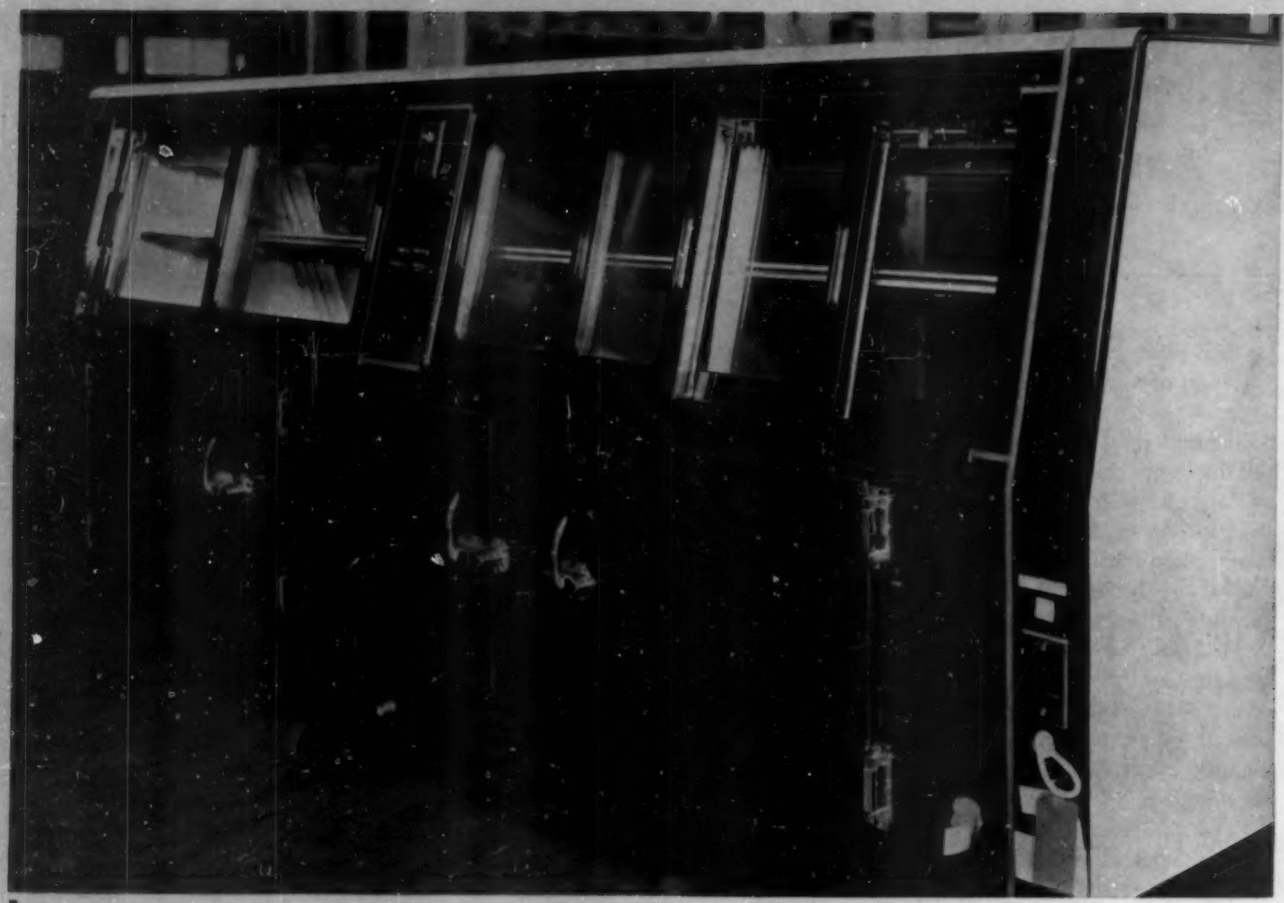
THE photographic darkroom has always been somewhat of a mysterious place. Bright light is taboo, and people who heedlessly open doors that let in a flood of light and ruin negatives are decidedly in the *anathema* class.

Yankee Safe-Light, a new, molded darkroom lamp that is claimed to be the perfect answer to the darkroom illumination problems is now on the market. The fixture is designed to give light without uncomfortable and damaging glare. It consists of an opaque bell-shaped housing made of black phenolic plastic and accommodating an ordinary 15 watt bulb in the interior of the dome. The filters which are made of translucent urea are screwed to the open end by means of threads. The filters, available in red, green, orange and yellow, are molded of photo-spectrum tested urea colors. The particular construction of the lamp permits it to be suspended directly from a dropcord without direct light reaching the eyes since light is thrown from the end nearest the work.

It is interesting to note that the socket is not cemented to the lamp housing, even though it is firmly attached and cannot be removed without breaking. The socket was screwed into the phenolic housing immediately upon its withdrawal from the mold and the natural shrinkage was permitted to grip the socket tightly in place. This method (*Please turn to page 96*)



Compact, convenient, easily and quickly installed, the darkroom lamp (above) is made entirely of heat-proof plastics. The bell-shaped part is molded of Bakelite black phenolic by Windman Brothers, and the filters are of photo-spectrum tested Plaskon. Providing a soft, even light that eliminates uncomfortable glare, the plastic filters (shown separately at the right) are available in red, green, orange and yellow. Construction of the unit permits it to be suspended from a dropcord so that direct light does not reach the eyes



Strong plastic-framed doors slide smoothly along molded rails on this display case (rear view). Molded of black Bakelite phenolic by Grigoleit Co. for Allied Store Utilities Company

Refrigeration efficiency

Large, intricately molded phenolic non-warping door frames and rails aid in insulating cold storage display cases

STRAWBERRIES in February used to be a boon from a fairy godmother until modern refrigeration made them a common blessing. The familiar display case of frozen out-of-season and in-season delicacies, an important fixture in food stores everywhere, has been an expensive item because of its size, weight and the material used for insulation. Now, come molded plastics bringing cool efficiency. For some time plastics have been used in home refrigerators for breaker strips, laminated doors, handles, trays and decoration. A major development this year is the use of large molded sliding door frames and rails on Hussman-Ligonier commercial refrigerators.

Beyond the vital importance of plastics in helping to preserve perishable foods, the strength, accuracy and size of these molded units indicate a new phase in commercial refrigeration. Possessing proper physical and mechanical characteristics, a range of five different sizes of door frames—19 in. by 28 in.; 19 in. by 25 1/2 in.; 19 in. by 20 3/4 in.; 14 1/2 in. by 25 1/2 in. and 14 1/2 in. by 28 in.—as well as different lengths of rails—40 1/4 in., 49 3/4 in. and 54 3/4 in.—has been produced at a reasonable cost and in sufficiently large quantities to make their use commercially possible.

In designing the door frames, it was necessary that they have sufficient strength to withstand rough handling. The continual sliding back and forth as the case is opened and closed constitutes hard wear, and means that the material used must be shock resisting. The primary function of the complete door, however, is

insulation against the outside heat, and the plastic had to supply fool-proof insulation between the inside coolness of the refrigerator case and the room temperature. Included in the problem of insulation was the matter of condensation. The material used for the door frames and rails had to be such that the door frame would not be cold enough to condense moisture from the atmosphere. Weight, another vital factor, had to be kept as low as possible so as to permit ease in handling and provide a possible saving on transportation costs. Finally, in order to withstand constant cleaning with strong soaps and solutions, the plastic had to have an inherent, high gloss and permanent finish. The use of a special phenolic molding compound made it possible to satisfy these various requirements.

Accuracy was an important consideration in the molding of these items—rather close limits for pieces of these sizes had to be maintained so that doors could be moved smoothly at all times. It was also imperative that the door frames be immune to warpage. These requirements were met by the design of the mold, and the technique of the molding, the type of material selected, plus the provision of suitable cooling fixtures.

A means of glazing the door frames was necessary, so that the conventional methods of mounting the glass in the door could be used. For various reasons it was discovered practical to adapt the door frames to present methods of glazing now generally used by the refrigeration industry. This made it necessary to provide ways of driving nails (*Please turn to page 94*)

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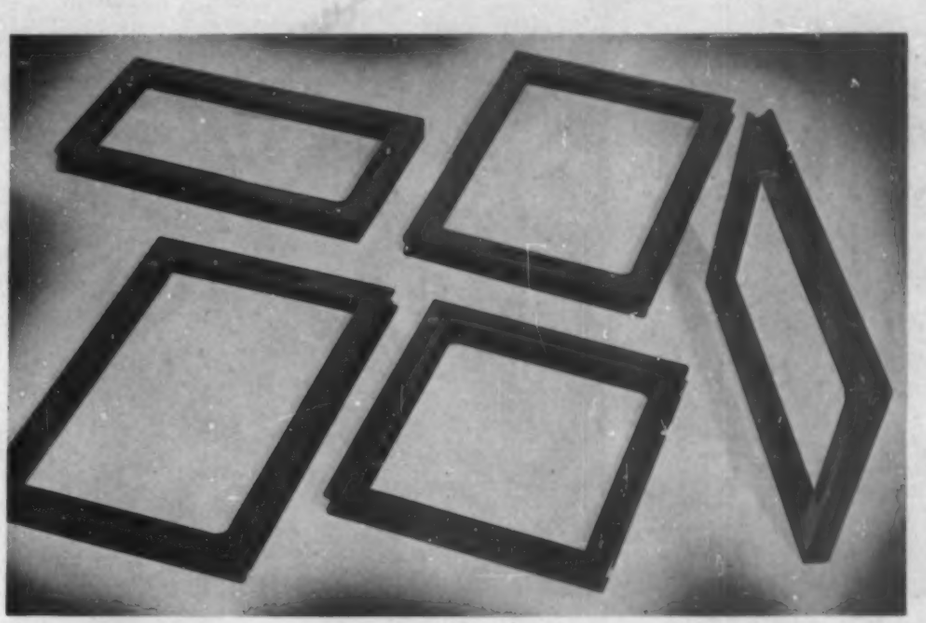

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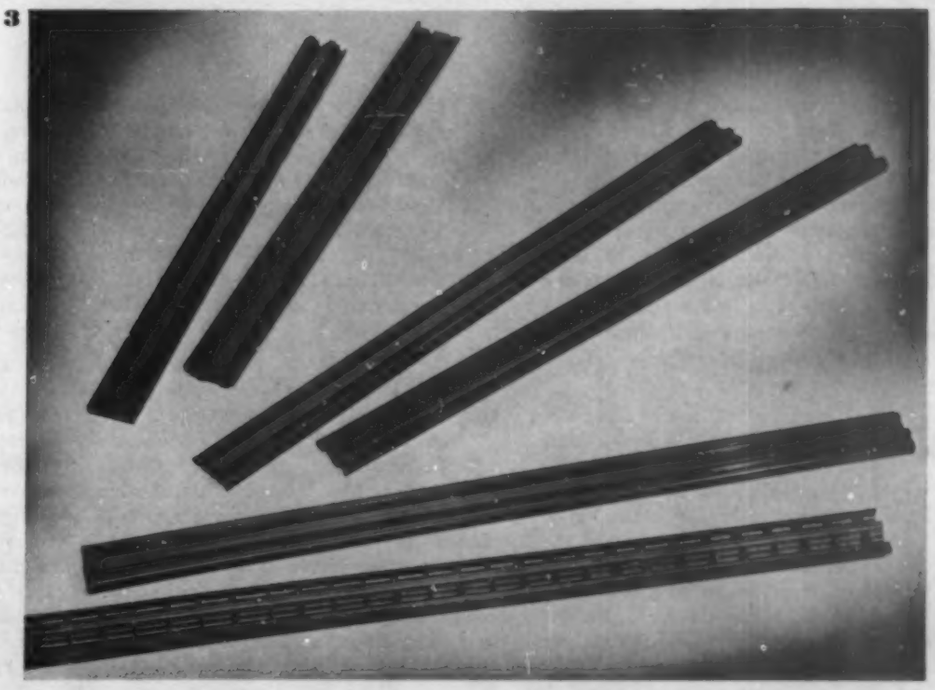

2—*Solidly constructed, the door frames are available in 5 different sizes. (Frame in lower right-hand corner shows the back of the unit. Thickness and cored construction are indicated by side view of the frame at the end. This hollow track reduces weight and saves material. Note the deep oval grooves on either side for convenient handling.)*
3—*Several sets of rails show the double tracks for the sliding doors and shock-resisting, reinforcing ribs at the back*

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PLASTICS

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1 Permitting clothes to slide away without pull or wear, a large phenolic washing machine agitator handles sheer or heavy fabrics at controlled speeds. Smooth and lightweight, it will not change color or corrode and resists severe impact and strong alkalies. Eclipse Moulded Products Co. molds it of Bakelite for Barton Corp. New water deflector provides extra water currents for quick and thorough cleaning

2 Designed for efficiency in flame characteristics, the restyled Koolite blowpipe of National Welding Equipment Co. has a plastic handle molded around the assembly for a firm grip. Light, durable and heat-resistant, the handle protects fingers against burning. Special leak-proof union permits rotation of head without using a wrench. Molded of red and green Durez and Bakelite by American Molding Company

3 Fisherman's delight, Rain-Beau coilers molded of lightweight transparent Tenite make carrying and storing of fishing lines a comparatively easy job for contemporary Isaac Waltons. Convenient coilers also allow rapid transferring of line to reels. Molded by Northern Industrial Chemical Co. for H. Schindler & Co., Incorporated

4 Light in the palm of your hand—press the handle of this pocket-size flashlight to generate the power. Operated without batteries, the Powerflo will not deteriorate with use. Housing and handle are molded of Tenite—resilient and resistant to hard wear. Transparent demonstration unit shows the mechanism. Streamlined shape and smooth finish allow compact fit in purse or pocket. Molded by Chicago Die Mold Mfg. Co. for Leterstone Sales Company

5 Revamping the classic cigaret gift carton, this scientifically built Lumarith humidor has a transparent well for water at the top. Specially designed plug connected to well, automatically humidifies the interior. Molded by Master Plastic Corp. for Axton Fisher Tobacco Co. Available in combinations of red and white, and blue and white. A pipe mixture is similarly packed

6 Surgically sound dilators, injection molded of cellulose acetate are used by veterinarians and dairy cow owners for correcting injuries or obstructions in the teat canal. Size, shape and proper contours are precisely controlled. Longitudinal flutes on the smooth shaft carry a medication. They are sterilized and packed in an antiseptic healing ointment. Molded for Dairy Association Co., Inc., by General Electric Company

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IN REVIEW

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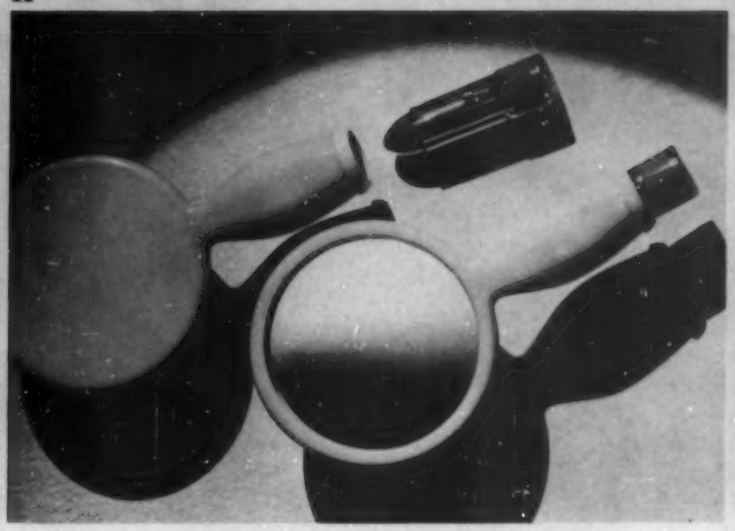

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7 An early start for the holiday trade—new Christmas greeting cards decorated with printed designs on Plastacele are being introduced by the Celomat Co. Some 40 designs are available at moderate prices. There are appropriate enclosure cards for gift packages, too. Particularly fine for those who like to save their collections of holiday cards. May be used for book-marks

8 Gliding smoothly on cruise ship decks or seashore courts, water- and weatherproof shuffleboard disks and cues of Durez and Bakelite resist the elements. Disks are in solid black and contrasting colors for easy identification. Cue heads, in various styles, weights and colors. Molded and marketed by Dayton Insulating Co. Complete sets are available from stock. They are highly resistant to warpage and cracking

9 If strangers stumble around in your photographic darkroom, better buy one of these Monsanto polystyrene funnels. Clear, but lighter in weight and less fragile than glass, funnels are unharmed by photographic chemicals and do not warp. Injection molded by Plastic & Die Cast Products Corp. for B. W. Utilities

10 Measuring 11 in. across the point, Lucite star, by Mr. and Mrs. E. L. Snyder, is designed for Christmas ornamentation. This view shows how a colored bulb is placed to throw light through the marginal flange and direct it forward from the polished edges outlining the star. Circular recessed ornaments in its flat wall also reflect light. Perforated opaque center disk covers the bulb permitting colored light to pass through the perforations

11 Tucked into the handle of a convenient 4¼ in. Miro-Lip purse mirror is a lipstick, easily accessible for a quick dab. Molded of ivory and pastel Lumarith. Product of Acme Novelty Mfg. Co. Compact and lightweight, the unit will not prove bulky in a purse

12 Astonishingly small, this lightweight plastic case holds a complete radio-type midget vacuum-tube hearing aid. Designed by Julian Davies, the case is curved to conform smoothly to body contours, is remarkably thin with strong corners and ends. Connecting plugs and filament volume control are plastic, too. Maico Co., Inc., do the molding using metal louvers and metal inlays that may be monogrammed. The device can be fitted to compensate for individual hearing defects as shown by precise audiometric records

13 Cooking odors, fumes and smoke are quickly and quietly dissipated by this modern kitchen ventilating unit. Blades and motor assembly are concealed by a white grille of Textolite plastic. Its single-speed switch is operated by means of a convenient pendant chain. Completely renews the air in an average sized kitchen in from 2 to 3 minutes. Molded by General Electric Company

14 For mothers who like to keep an accurate check on how the baby grows, this Lamicoid Infantometer in black and white is just the thing. Replacing wood, this device is sanitary, smooth and has permanent characters inherent in the lamination. Made by Insulating Fabricators, Inc., for American Medical Specialty Co. Lightweight and easy to handle, this measuring device is a handy gadget for the nursery

15 Beauticians will appreciate this West-Eez tray which keeps hair pins handy when and where they are needed. Lightweight, easy to keep clean, this shoulder shelf has a permanent finish that will not wear off; it's easy on the customer, too. Designed by Hubert Utterback and molded of Beetle by Anfinsen Molding Co. for West-Eez Shoulder Shelf Co. Curved to fit the neck, the device has a section on either side for holding pins

16 Photographers who wish to vary shapes of photos will like the semi-transparent printing masks of Plastacele. Outside dimensions measure 4 by 6 in. Keyhole, diamond, circle, heart and oval shapes are available in a deep red that holds back the light and prevents fogging. Made by Alfren Specialty Co. Can be used almost indefinitely without fraying or deterioration

17 Medical barbering and delicate hair removal around wounds and areas where a razor or clipper cannot be used is readily accomplished with the Monroe Trimmer with its small cutting edge and angular shaped head. Sanitary, self-insulated Durez housing is molded by B. F. Oshei, Inc., for Foxhill Products, Inc., and can be thoroughly sterilized for hospital use as well as beauty salon, barber shop and home

18 For travel or home use, this compact toothbrush holder keeps bristles clean and dry. Perforated sides allow constant circulation of air. In soft pastel tints to harmonize with bathroom color schemes. Injection molded of Tenite by Ericcson Mfg. Co. for 20th Century Products Co. Sanitary and convenient, this plastic container will be appreciated by those who are meticulous about personal cleanliness

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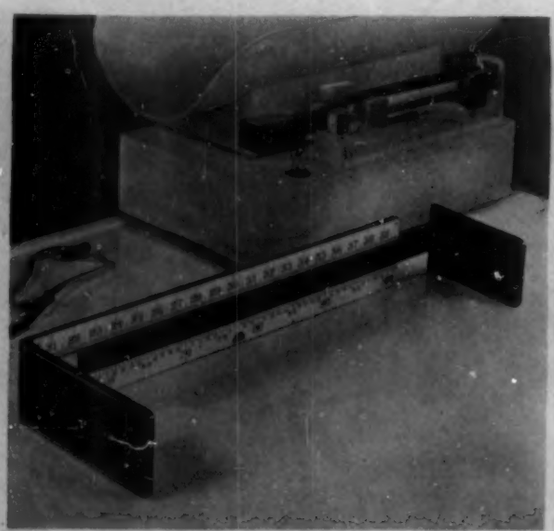

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PLASTICS

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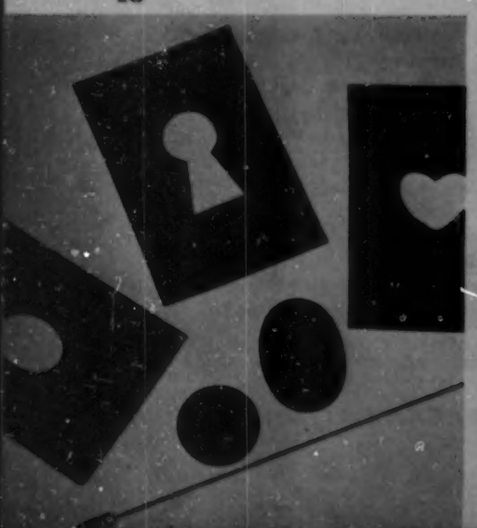

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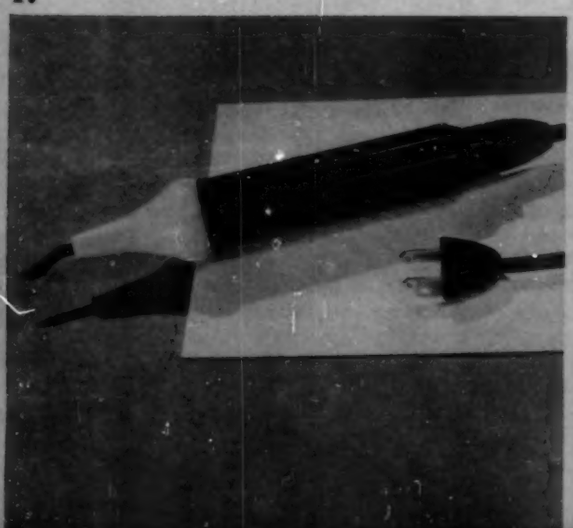

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19 Cinema fans or concert lovers—they're unanimous about comfort. These armrests, smooth, clean-looking and wear-resistant please patrons and delight managers. Designed by Leo Jiranek for Lloyd Mfg. Co., they are molded of Resinox for left, right and center arms by Eclipse Moulded Products Co. Inset shows under side with molded bosses for fastening. Available in a variety of colors to harmonize with theater interiors

20 Reduce the desk top gadget collection with Executive Deskit of black Bakelite with provision for perpetual calendar, wells for paper clips, places for an eraser and pencils. Ideal for an advertising premium. Molded by Kuhn & Jacob Moulding & Tool Co. for Alfred Robbins Organization. Wear-resistant with a permanent finish, this unit is a welcome addition to any desk

21 For that hazardous job of transporting face powder from box to compact, Cupid powder scoops perform the task without waste from spilling. Reminiscent of the kitchen sugar scoop, these tiny replicas have deep curved sides. Injection molded of Lumarith in pastel colors; scoops are well designed to carry a substantial amount of powder. Product of Bolta Comb Company

22 Inexpensive but efficient, these good looking super-power field glasses of approximately triple magnification are housed in molded Lumarith. Strong, lightweight, these sports glasses have a permanent finish and will neither rust nor corrode. Made by Columbia Protektosite Co. They are an appropriate accessory to the modern sports ensemble, besides being attractively priced so that all the family can now have field glasses

23 Several sizes of furniture rests in both nail and cotter types are now available in molded Durez. The ball socket construction makes them readily adaptable to various styles of legs. A dark neutral brown is the shade selected since it will blend with practically any color scheme. Molded by Armstrong Cork Co. These rests are durable and have a permanent finish

24 Compact in size and handsome in appearance, this lustrous Beetle high fidelity vacuum tube hearing aid has a perforated area of metal through which sound is amplified. Smooth, pleasant to touch and easy to carry, the unit is available in pastel tints. Product of Telex Products Co. Device is well designed and sturdily constructed for the utmost utility, and can be readily cleaned with soap and hot water

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IN REVIEW

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1—Embossed frieze of Lucite and a valance of the red and clear acrylate rods fabricated by Industrial Arts enhance the sand-toned Plastaloid walls and recessed cases in the E. J. Brach & Sons candy display room executed by Florence Ely Hunn, A.I.D. Materials are highly decorative and practical, assuring low maintenance costs

Setting for sweets

Designed for efficiency, a candy display room employs modern media in creating backgrounds for sales

REMEMBER the corner sweet shop with its fascinating glass jars of multi-colored assortments of peppermints, gumdrops and licorice? Remember how the sight of so many tempting goodies brought a panic of indecision because five cents would not buy the whole lot? Most of us still feel that way—the more we see, the more we want. One enterprising candy manufacturer has carried over the same idea to an elaborate wholesale display room where, in streamlined surroundings with air-conditioning, plastic decorations, and fluorescent lighting, a brilliant display of popular priced candies exercise that same appeal of making customers want to buy in quantity lots.

With glass-enclosed shelves filling most of the available wall space, as well as an attractive window featuring seasonal displays, the effect is one of cleanliness, efficiency and abundance. The fluorescent lighting which is enhanced by an extensive use of sparkling methyl methacrylate plastic, bent glass mirror and chromium trim is largely responsible for this bright, clean appearance. Walls and recessed cases are faced with a laminated plastic. This material is a urea composition of flexible, strong laminated construction, which is applied directly to the walls with special adhesives; this method dispenses with the prefabrication of materials to plywood or fiberboard. The laminated plastic is used in three sand shades, and the seams are covered with bevelled strips of the material in an ivory tone. These light colors are particularly fitting for a display room, since they are neutral and subdued and thus form an unobtrusive background for the brilliance of the plastics, glass and chromium. These shades are also ideal for the various colored seasonal displays which will be set up in the cases from time to time. The floor is covered with a special marbleized tile that blends with the walls, and carries a feature strip of cobalt

blue. The ceiling is covered with acoustical material.

The cornice over the corner display cases is very effective with its specially designed freize of the clear plastic. The embossed design of this freize was achieved by sand-blasting and pressure molding. Rods of the clear and rich red plastic form a valance, and serve to conduct light toward the merchandise.

The display room is also used for meetings with groups of jobber salesmen and for conferences with key buyers. An alcove off the main area is fitted with a table fabricated of methyl methacrylate plastic. A 3 ft. by 6 ft. plate glass top is supported by 8 in. hollow plastic columns. The stretcher and apron are also made of the clear plastic. Six modern chairs fashioned of chromium tubing are upholstered with a bright red leatherette. The walls beside this grouping are treated in a very interesting and practical manner, particularly from a display point of view. Large glass containers hold various types of candy all arranged in a precise manner. The customers are not only able to view the candy at a glance, but the colors and varieties of sweets form very unusual wall decorations. The raw ingredients used in making the candy are displayed in glass bottles standing on shelves that are supported by brackets formed from rods of the clear plastic.

The company reports that they had never had an adequate method of visualizing to their customers the many varieties of bulk and box candies that they manufacture. They were also handicapped in their efforts to demonstrate to these customers effective and dramatic methods for displaying such merchandise at the point of sale. In this well-designed show room, however, it is possible to demonstrate planned window displays. Special displays for such holiday seasons as Halloween and Christmas (Fig. 1) can be set up so that customers may visualize display possibilities.

It is reported that the client feels that these various needs have now been solved thanks to the ingenuity of the interior designer and the use of modern media such as plastics. Mr. Theodore Stempfel, vice-president of the firm, says that the display room has not only made a very favorable impression on the many customers who have already seen it, but the time, effort and money involved in the construction has, in the brief space of two months, already been repaid in increased prestige for the firm and its products.

2—Designed for conferences and chats with buyers this grouping has a table of methyl methacrylate designed by Leonard Scheff in collaboration with Florence Ely Hunn and made by Industrial Arts. Hollow plastic columns support the glass table top. 3—Close-up view of the cornice shows the specially designed freize of the clear acrylic which is the result of a combination of sand-blasting and pressure molding. This is combined with bent glass and non-reflecting mirrored bands over crystal and red plastic rods which form a valance. 4—Bottles of raw ingredients line the hanging shelves supported by brackets of the colorless plastic

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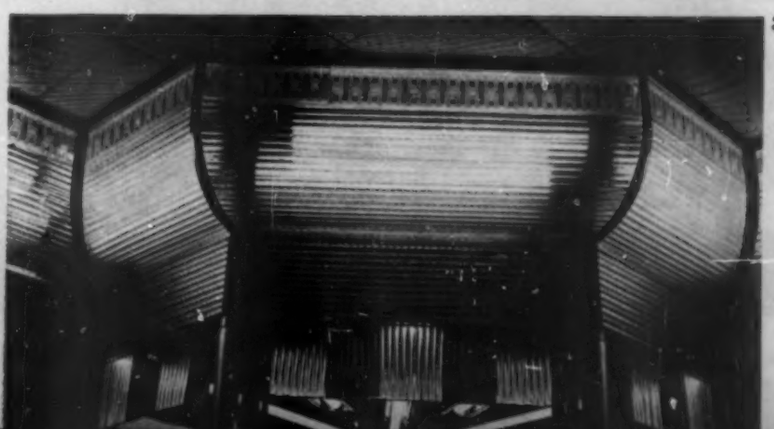

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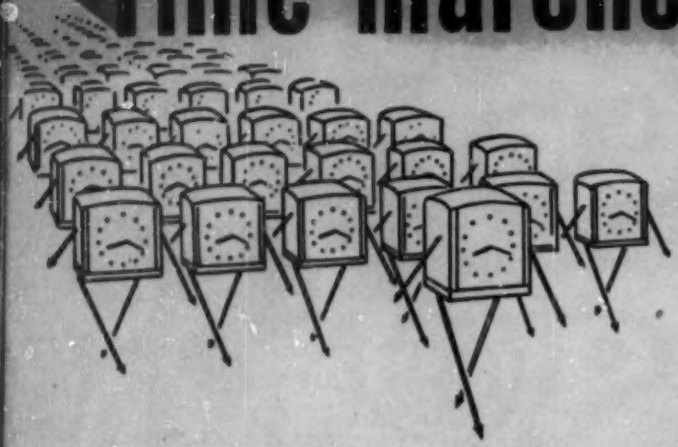
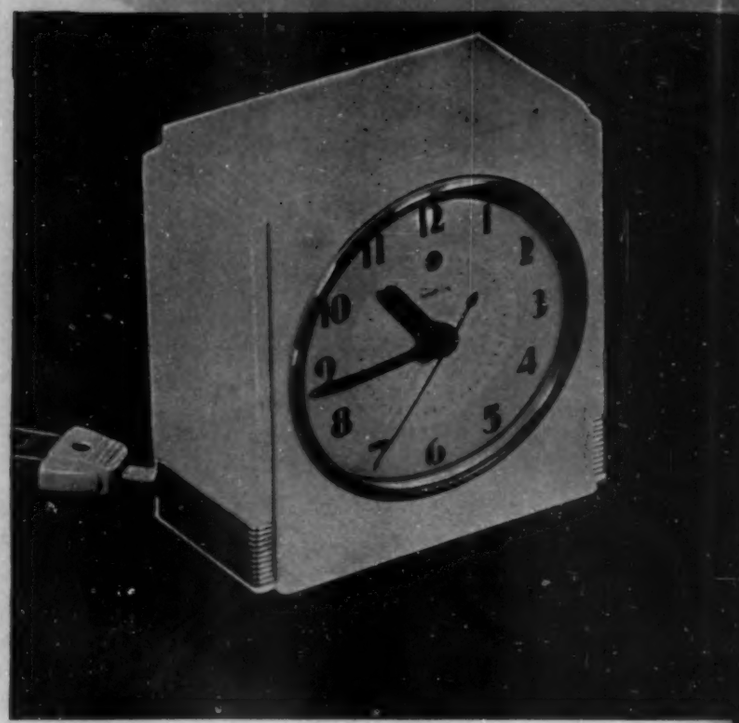
Time marches on - *as told by*





● It's a far cry from the old-fashioned, key-winding mantel clock to today's electric Telechron timepiece!

Compact . . . accurate . . . beautiful . . . in the complete line of Telechron models there are styles and colors to grace every room in the modern home.

Attractive design and harmonious color in the cases for Telechron clocks have been achieved with Molded Plaskon, the world's largest-selling urea-formaldehyde plastic.

There are many reasons why Plaskon Molded Color was chosen by Telechron. A fine clock must be gracious and living . . . Plaskon supplies warm, glowing colors for this need. Light weight is combined with great strength. No matter how severe the conditions under which Plaskon must serve, it will not chip, corrode, rust or tarnish. And its smooth, hard, non-porous surface cannot be stained or scratched. Being solid molded color, Plaskon tone values are permanent.

Is the appeal of your product directed to women . . . to men . . . to both . . . or are you interested in greater manufacturing advantages?

Ask us for suggestions on how Molded Plaskon may be able to give your merchandise new opportunities for profit in production and sales. A letter or wire will bring an experienced Plaskon representative quickly.

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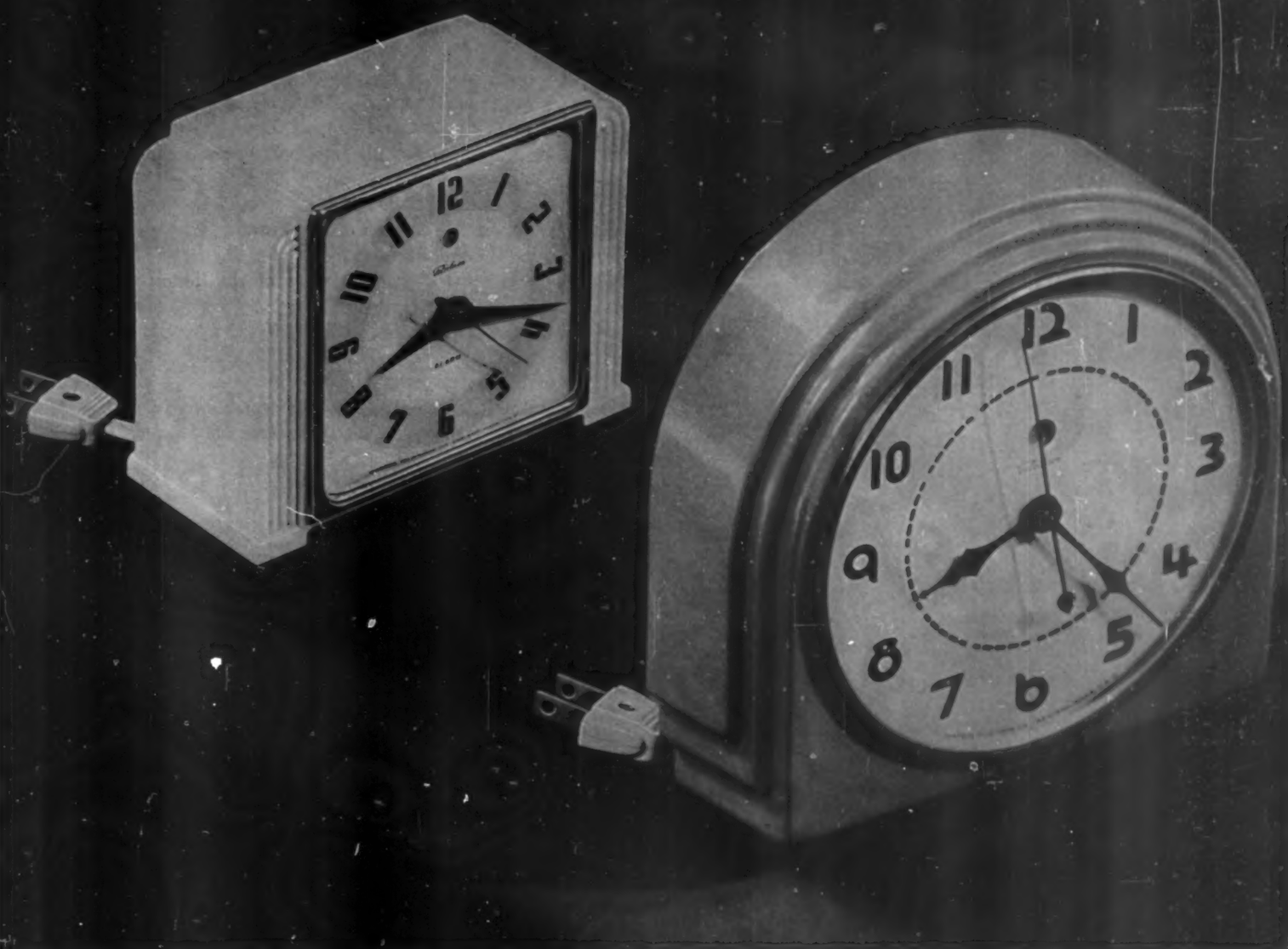
PLASKON

★ MOLDED COLOR ★

Telechron



This is a group of fine Telechron clocks showing the cases molded from Plaskon. This material is supplied in powder form for molding by heat and pressure into an endless variety of shapes and sizes. It can be furnished in a complete range of beautiful tones, to harmonize with the character of any product and to enhance appeal to all types of people.

Stop that sneeze!

by CHARLES LICHTENBERG*

Plastic breathing aids come to the rescue of chronic allergy sufferers

SNEEZES and sniffles have come under the sway of plastics with the result that discomfort is being conquered. For years allergics who suffer from the effects of air-borne pollen and other particles have been the butt of jokes and cartoons by people who did not have to look forward to a couple of months of suffering every year. This brand of humor has declined in popularity, though, as better methods of treating hay-fever, colds and similar disorders are found. A great deal of progress has been made in finding the cause of them and in working out means for relief. Among the various devices introduced are the polystyrene Diathermizer, a therapeutic aid for spreading soothing vapors throughout the respiratory tract, and the Pollenex, an inconspicuous breathing guard, made of cellulose acetate plastic, that fits comfortably over the nostrils. (See page 96.)

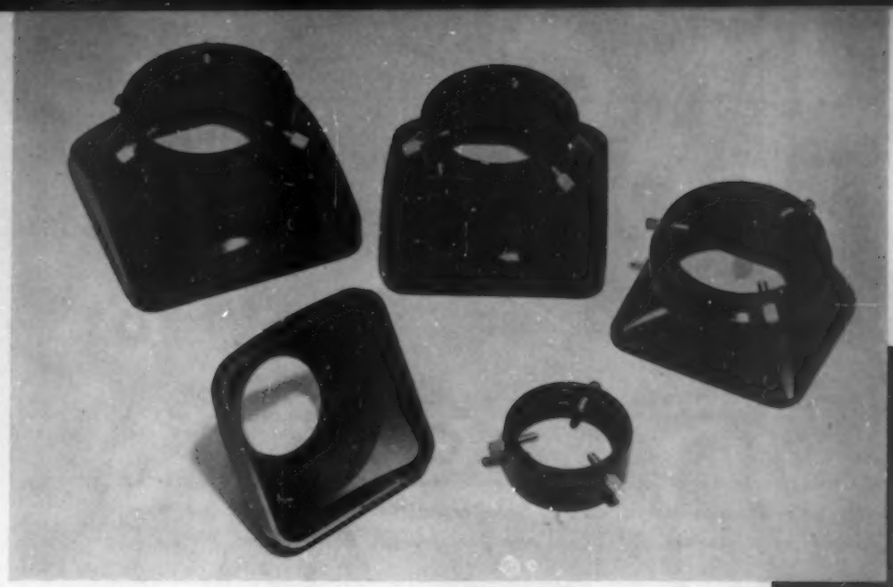
* Mgr. Molding Powder Sales, Plastics Div., Monsanto Chemical Co.

The Diathermizer (pictured below) consists of five parts, all molded of chemical-resistant polystyrene. One of these, a cylindrical container, holds hot water. Within this is another cylinder, the lower half perforated. Both cylinders are closed by another molded part which fits over the top, and to which interchangeable nose or mouthpieces are attached.

Use of the device is simple. The container is partly filled with hot water to which a few drops of medication are added. The perforated cylinder is inserted so that the holes are below the liquid level and the closure put in place. Then the user inhales through either the oral tube or nasal piece, causing the water to bubble as the air is drawn through. This bubbling, plus the heat, vaporizes the medication and sends it into the far reaches of the irritated passages, concentrating high heat and vapors in the respiratory tract.

Without any semblance of bulk or weight, the inhalator is strong, serviceable and pleasant to handle. Even though the material used is thermoplastic, and is molded readily in the deep draws that the design of the unit requires, it is not affected by hot water. Furthermore, the medication is not affected by contact with the moldings. The efficiency of the Diathermizer is improved by the heat-retentive properties of the plastic material, since it keeps the water hot for a longer period. It is said that (*Please turn to page 96*)

Five parts, molded of Monsanto polystyrene by Allied Plastics Corp., comprise a liquid and chemically resistant device for relieving respiratory and nasal congestion



Available in six different sizes, the Princeton combination sunshade and filter holder is molded of black Tenite by the Bridgeport Molded Products Co. Smart, practical design along with economy, lightweight and ability to stand abuse are among its best sales features. Four filter holders of various sizes, plus an adapter ring, are shown above. At the right, is one of the molded adapters in position on the camera front

Sunshade and adapter

THE advent of hordes of "professional" amateurs in the field of photography has had a natural and very definite effect upon the cost of cameras and photographic equipment. Manufacturers are pleased, naturally, with the increased sales; at the same time they are willing to admit that the economy found in the use of molded plastics for certain photographic accessories and parts of cameras has enabled them to cut production costs and thus pass their savings on to the consumers in the form of lowered prices.

A small, but important, item recently introduced by the Price Industries Corp. might be taken as a good, illustrative example of this cost factor. This company recently put on the market its new Princeton combination sunshade and filter holder, to be used for making photographs with any camera. The filter adapter, or holder, itself is not new, but the fact that it is made of molded cellulose acetate is news.

This device is scientifically calculated to shut out, completely, extraneous light from the camera lens, and to afford protection against light-reflection. The adapter fits over the lens barrel and is held securely by three small screws. Formerly, this camera accessory was made of metal, and required a special coating of flocking on the interior to guard against any possible reflections of light.

The molded plastic holder eliminates all possibilities of reflection, because in the injection molding process a dull finish is automatically given to the interior of the piece, thereby doing away with the coating operation and at the same time providing permanent protection against the reflection hazard.

Entirely different in design, this adapter utilizes the square shape. This *square* was chosen because it eliminates the danger of cutting the corners of pictures when using the shade on a (*Please turn to page 100*)

1

2

1—Prominence of the inserts is shown in this view of a molded Bakelite phenolic swing arm assembly magnified 1½ times. 2—The open mold with the splits and several circuit breaker units are lined up against a ruler to illustrate relative size. Molded by Quintard & McIlhiney for Joseph Pollak Corporation

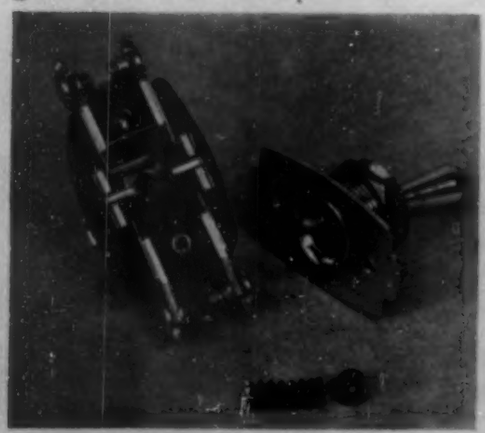
Tiny swing arm assembly

MEASURING less than one-fourth of an inch in length—but a vital link in complicated electrical device—a mite-sized swing arm assembly relies on plastics, accurately molded, for strength and insulation. Used as a circuit breaker in a small switch this device aids in reversing the motor for rewinding the film on home movie projectors. The current then enters the piece on the outstretched arms, travels through the inserts and is conducted to contacts which brush the metal parts opposite the molded plastic portion.

Molded of medium impact phenolic, the plastic area renders valuable service: not only is electrical insulation provided between the two lines of electrical energy, but each line is insulated from contact with the switch control lever; the contacts are held in proper position; and the strength to move the contacts is furnished.

The chief molding difficulty lay in the fact that the two inserts comprised practically the whole piece. Although the tolerances for the molded portion were all 0.0025, it was rather difficult to hold the inserts in the mold and achieve the desired dimensions. To solve the problem a mold with two splits to hold the inserts was constructed. The splits were knocked from the mold bringing the pieces out with them, the splits then being slid off the inserts. Because of the precision required, the slots for the inserts had to be small enough to maintain them without any movement. It was found, however, that these pieces could not be removed from the splits without loosening the inserts. This situation was remedied by constructing the splits in such a way that they would open away from each insert, then the piece could be removed without any difficulty or excess strain. Each of the two splits was in turn separated into three portions along the line of the slots making it possible to move the ends of each away from the center freeing the inserts.

3



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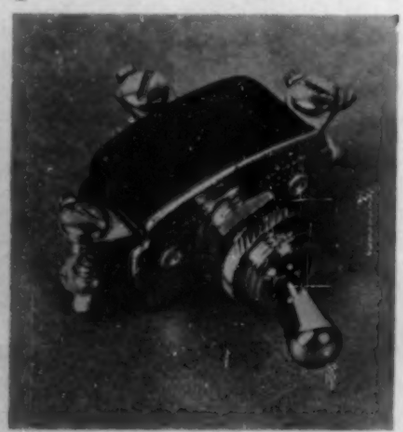


3—Assembled unit is opened to show the position of the swing arm assembly. 4—Complete switch has outer case molded of Makalot

Stock Molds

SHEET NINETY-NINE

Modern closures in various sizes and colors for standard bottles and cans, are available without mold cost from stock molds. Address Stock Mold Department, Modern Plastics, Chanin Building, New York, for manufacturers' names and addresses

---

1190. Ribbed edge 33 mm. cap. Diameter 1 3/8 in. 1/2 in. high. Lined with resin-coated paper bonded to pulp disk

1191. Ribbed edge 30 mm. cap, lined as 1190. Diameter 1 5/16 in. 1/2 in. high

1192. Ribbed edge, 28 mm. cap, lined as above. Diameter 1 1/4 in. 1/2 in. high

1193. Ribbed edge 24 mm. cap, lined as above. Diameter 1 1/16 in. 1/2 in. high

1194. Ribbed edge 22 mm. lined cap Diameter 1 in. 7/16 in. high

1195. Ribbed edge 20 mm. lined cap Diameter 7/8 in. 7/16 in. high

1196. Ribbed edge 18 mm. lined cap. Diameter 13/16 in. 7/16 in. high

1197. Short skirt, fine knurl, 3-step 13 mm. cap. Diameter 5/8 in. 7/16 in. high. Peg or well available

1198. Short skirt, fine knurl, 13 mm. cap. Diameter 5/8 in. 3/8 in. high. Available with peg or well

1199. Short skirt, fine knurl, 6-step, 10 mm. cap. Diameter 1/2 in. 1/2 in. high. Available with peg

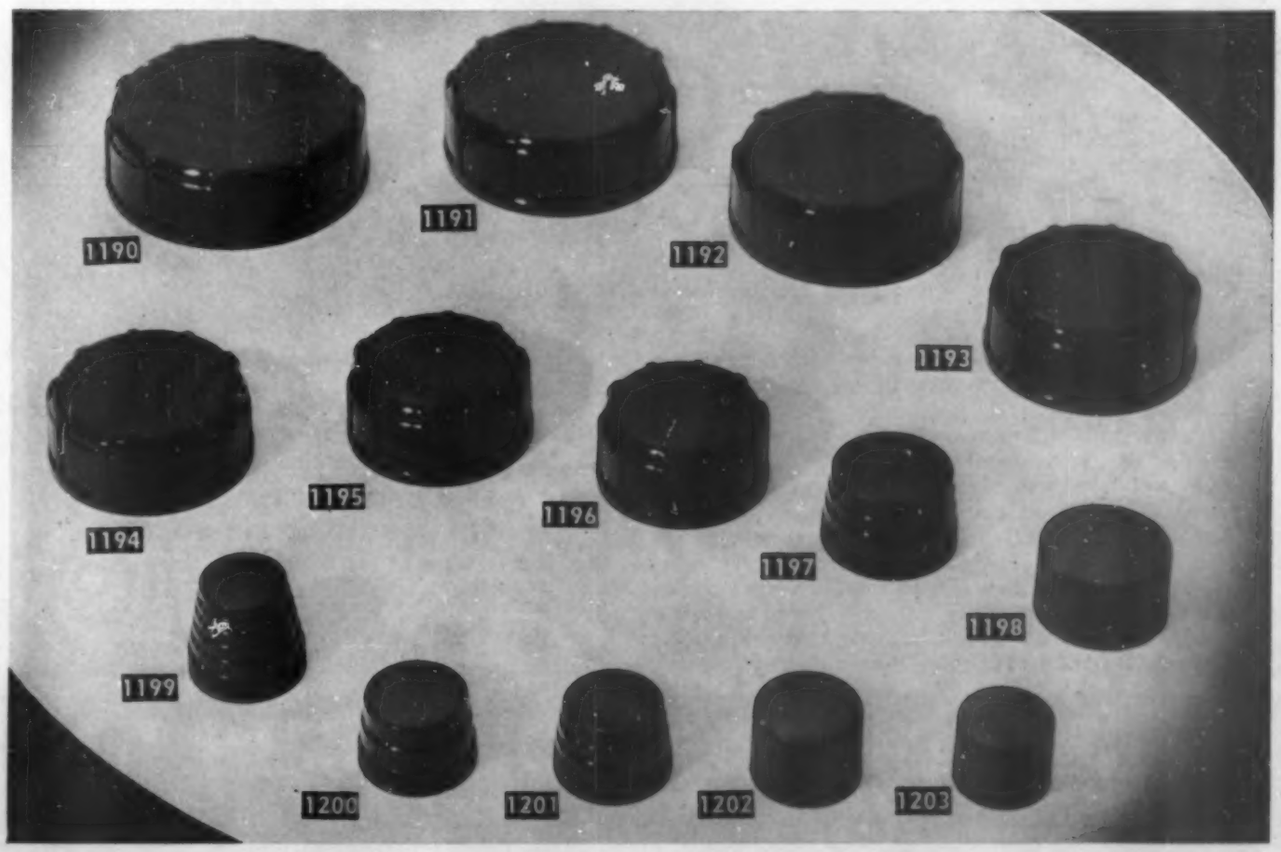
1200. Short skirt, fine knurl, 3-step, 10 mm. cap. Diameter 1/2 in. 1/2 in. high. Available with peg

1201. Short skirt, fine knurl, 4-step 10 mm. cap. Diameter 1/2 in. 3/8 in. high. Available with peg

1202. Short skirt, fine knurl, 10 mm. cap. Diameter 1/2 in. 3/8 in. high. Available with peg

1203. Short skirt, fine knurl, 8 mm. cap. Diameter 3/8 in. 5/16 in. high

All molders are invited to send samples from stock molds to appear on these pages as space permits

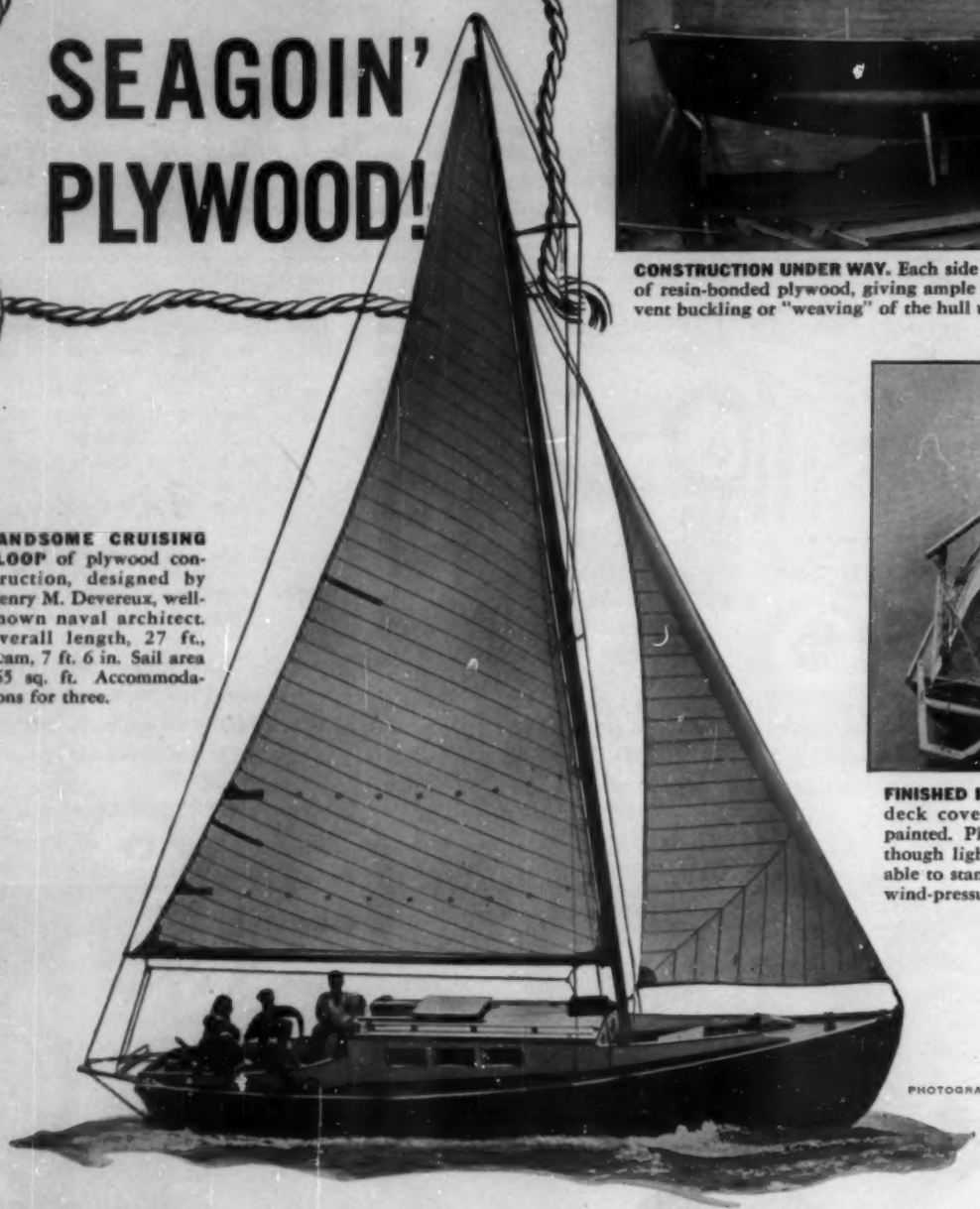


SEAGOIN' PLYWOOD!

CONSTRUCTION UNDER WAY. Each side is one continuous sheet of resin-bonded plywood, giving ample reserve strength to prevent buckling or "weaving" of the hull under sail.

FINISHED BOAT, showing plywood deck covered with canvas and painted. Plywood deck and hull, though light in weight, are easily able to stand the terrific strains of wind-pressures on the rig.

HANDSOME CRUISING SLOOP of plywood construction, designed by Henry M. Devereux, well-known naval architect. Overall length, 27 ft., Beam, 7 ft. 6 in. Sail area 365 sq. ft. Accommodations for three.



PHOTOGRAPH BY M. ROSENFELD, N. Y.

HERE SHE BLOWS... the plywood boat! Long a theory—now a practical reality, thanks to hot-press phenolic resin-bonded plywood!

Time was, not so long ago, when plywood couldn't stand the gaff of such exposure and service. Even today the average plywood won't do this—or anything approaching it—but Durez phenolic resin glues will make a plywood that stands this service. Today such leading plywood manufacturers as M & M Woodworking Co. have found that Durez phenolic glues give plywood resistance to heat, cold and weather, immunity to fungus growth and warping. Even boiling water and live steam tests fail to break down the tough Durez bond!

It's an interesting subject—Durez bonded plywood, and we'll be glad to send you more information on its applications and manufacture if you'll just write Durez Plastics & Chemicals, Inc., 589 Walck Rd., North Tonawanda, N.Y.

A FEW OF THE MANY USES OF DUREZ BONDED PLYWOOD

AIRPLANE HANGARS	EXPORT AUTO BOXES
BAKING TRAYS	MARINE CONSTRUCTION
BILLBOARDS	PORTABLE BUILDINGS
CONCRETE FORMS	TRUCK TRAILERS
GARAGE DOOR PANELS	OUTDOOR FURNITURE

DUREZ PLASTICS & CHEMICALS, INC.

PLASTICS THAT FIT THE JOB

Effect of heat on phenolic laminates

by S. W. PLACE*

THE purpose of this article is to shed some light on the behavior of phenolic laminates in applications or under conditions where they are subjected to elevated temperatures. Needless to say, the number of applications for phenolic laminates influenced by exposure to high temperatures is small, but where these applications do arise the results of this investigation will be helpful to engineers and designers.

Specimens of standard grades of phenolic laminates were subjected to elevated temperatures ranging from 250 to 400 deg. F. for various periods, and the effects of these temperatures upon the dimensional stability, hardness, tensile strength and water absorption of the specimens were determined. The organic nature of the phenol-formaldehyde resin and the paper or fabric base precluded the use of temperatures exceeding 400 deg. F. Temperatures exceeding 400 deg. F. cause fairly rapid carbonization of both the resin and cellulosic base and the eventual disintegration of the combination. As a matter of fact, slow carbonization takes place at much lower temperatures depending upon the length of time of exposure and temperature.

Tests of dimensional stability were conducted on samples 2 in. by 2 in. by approximately 1/4 in. thick at temperatures of 250 deg. F. for periods of one month and one year. The tensile test specimens were straight bars 1 in. wide by 12 in. long. The speed of test was 0.2 in. per minute, otherwise standard NEMA procedure was followed. The water absorption test samples were ASTM standard 1 in. by 3 in. by the thickness of the sheet, and the ASTM standard procedure was followed.

The test figures shown in Tables 1 and 2 were observed at room temperature after exposure at temperatures of 250 and 360 deg. F., respectively. The effects at 360 deg. F. were so severe that this test was run for only 24 hours. The tests at 250 deg. F. were continued for 30 days. The tests were then interrupted, and the specimens weighed and measured at room temperature.

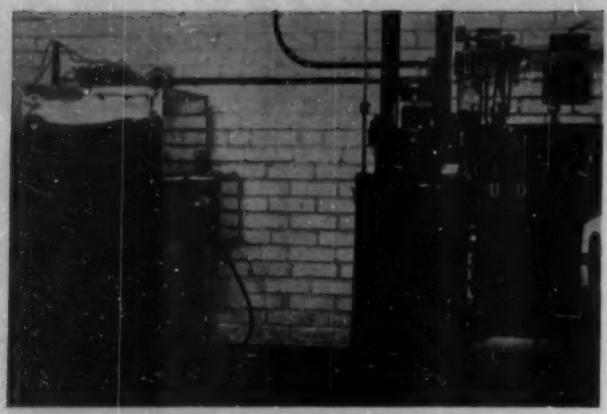
* Chief Engineer, Synthane Corp.

TABLE 1. WEIGHT, DIMENSION AND HARDNESS CHANGES OF PHENOLIC LAMINATES AT 250 DEG. F.

The specimens were 2 in. square and 1/4 in. thick and were stabilized by exposure to 280 deg. F. for 24 hours prior to the tests at 250 deg. F.

Grade of phenolic laminate	Weight change		Dimensional change						Rockwell M scale hardness		
			30 days			1 year					
	30 days	1 year	Length	Width	Thickness	Length	Width	Thickness	After stabilization	After 30 days at 250° F.	After 1 year at 250° F.
	percent	percent	in.	in.	in.	in.	in.	in.			
AA natural	−0.55	−1.27	−.003	−.002	−.0019	−.011	−.003	−.0078	108	112	90
A natural	−0.60	−1.67	−.005	−.002	−.0046	−.011	−.002	−.0161	100	103	116
L natural	−3.33	−21.8	−.012	−.013	−.0024	−.104	−.104	−.0244	110	107	40
C natural	−2.95	−20.9	−.010	−.011	−.0008	−.083	−.089	−.0142	107	104	32
CE natural	−1.36	−15.4	−.006	−.006	−.0025	−.076	−.080	−.0221	112	109	52
X natural	−3.12	− 9.5	−.004	−.009	−.0052	−.013	−.021	−.0276	108	116	...
XX natural	−2.56	−3.10	−.004	−.008	−.0032	−.005	−.010	−.0042	112	120	112
P chocolate[1]	−1.63	−2.20	−.002	−.004	−.0015	−.002	−.004	−.0025	95	106	...

[1] This material was 1/8 in. thick.



Pictured above are two views of Synthane Corp.'s laboratory testing equipment

The specimens were then replaced in the oven and left for an elapsed time of one year, and again weighed and measured at room temperature.

Tables 3 and 4 show the effect of exposure for various periods at temperatures from 250 deg. F. up to 400 deg. F., upon the tensile strength, water absorption and Rockwell hardness of phenolic laminates. The measurements were made after the heat-treated specimens had cooled to room temperature.

Attention is called to the fact that the 24-hour stabilization period imposed on the samples prior to tests causes a loss of weight and change of dimensions of from 2 to 4 percent. However, this stabilization period was found necessary to prevent blistering at some of the higher temperatures and hence was adopted for all of these tests.

Table 5 lists the standard specifications of the National Electrical Manufacturers Association for the phenolic laminated products used in this investigation.

The following general conclusions can be drawn from these experiments:

1. Cotton-fabric-base phenolic laminate which is suitable for continuous duty at temperatures up to 200 deg. F. can be used for intermittent duty at temperatures up to 250 deg. F. Higher temperatures up to 360 deg. F. may be applied sparingly, provided the material is thoroughly stabilized or heat treated beforehand to avoid blistering at these high temperatures.

2. Paper-base phenolic laminate is suitable for continuous duty at temperatures up to 250 deg. F., and, if thoroughly stabilized, for intermittent duty at temperatures up to 320 deg. F. and for occasional duty at temperatures of 400 deg. F.

3. Asbestos-paper-, asbestos-fabric-, and glass-fabric-base phenolic, laminates are suitable for continuous duty at temperatures up to 250 deg. F.,

TABLE 2. WEIGHT, DIMENSION AND HARDNESS CHANGES OF PHENOLIC LAMINATES HEATED AT 360 DEG. F. FOR 24 HOURS.

The specimens were 2 in. square and 1/4 in. thick and were stabilized by exposure to 280 deg. F. for 24 hours prior to the test at 360 deg. F.[1]

Grade of phenolic laminate	Weight change	Dimensional change			Rockwell M scale hardness
		Length	Width	Thickness	
	percent	in.	in.	in.	
Glass-fabric base[2]	−2.37	−.007	−.0065	+.0013	103
Glass-fabric base[3]	−2.08	−.001	−.0015	−.0001	98
A	−1.76	−.002	−.003	−.0025	103
AA	−2.25	−.003	−.005	−.0003	111
CE	−4.00	−.007	−.010	+.0047	106
P[4]	−2.64	−.003	−.006	−.0019	101
XXX	−2.49	−.004	−.006	+.010	99

[1] Grades, X, XX, K and LE which were also tested under these conditions failed due to blistering before the end of the 24-hour exposure to 360 deg. F.

[2] This material was 5/16 in. thick.

[3] This material was 3/16 in. thick.

[4] This material was 1/8 in. thick.

TABLE 3. TENSILE STRENGTH, HARDNESS AND WATER ABSORPTION OF PHENOLIC LAMINATES AFTER EXPOSURE AT ELEVATED TEMPERATURES

Grade of phenolic laminate	Thickness	Group 1: Samples stabilized 24 hours at 280 deg. F. — Tensile strength	Group 1 — Rockwell M scale hardness	Group 1 — 24 hr. water absorption	Group 2: Samples stabilized 24 hours at 280 deg. F. subjected to temperature of 400 deg. F. for 24 hours — Tensile strength	Group 2 — Rockwell M scale hardness	Group 2 — 24 hr. water absorption	Group 3: Samples stabilized 24 hours at 280 deg. F., subjected to temperatures of 280 deg. to 320 deg. F. for 48 days — Tensile strength	Group 3 — Rockwell M scale hardness	Group 3 — 24 hr. water absorption
	in.	lb./sq. in.		percent	lb./sq. in.		percent	lb./sq. in.		percent
XX natural	1/8	18,800	112	0.61	7,150	100	1.42	16,500	116	0.69
XX natural	1/8	15,500	110	1.13	6,800	105	1.82	11,100	117	1.06
C natural	1/8	9,200	106	3.25	3,680	102	3.47	5,940	107	....
P black	1/8	15,500	95	1.12	2,945	80	1.76	9,050	98	0.94
AA natural	5/32	11,600	105	1.44	9,495	99	1.95	7,120	104	1.30
Glass base natural.	3/16	9,025	100	2.98	.....	...	....	7,600	103	4.24
XXXP natural	1/16	9,600	...	0.65	6,350	112	0.79	.....	...	....

and, if thoroughly stabilized, for intermittent duty at temperatures up to 320 deg. F. and for short periods of intermittent duty up to temperatures of 400 deg. F.

It should be borne in mind that at temperatures of 250 deg. F. and higher there is a continuous disintegration of both the cellulose fibers and the resin, and the higher the temperature the faster this disintegration proceeds. However, considering the many other desirable properties of phenolic laminates, the time required for disintegration may well be an acceptable period of service. Asbestos- and glass-base materials are, of course, superior in this respect and can be expected to give longer service under given temperature conditions than any cellulosic-base ma-

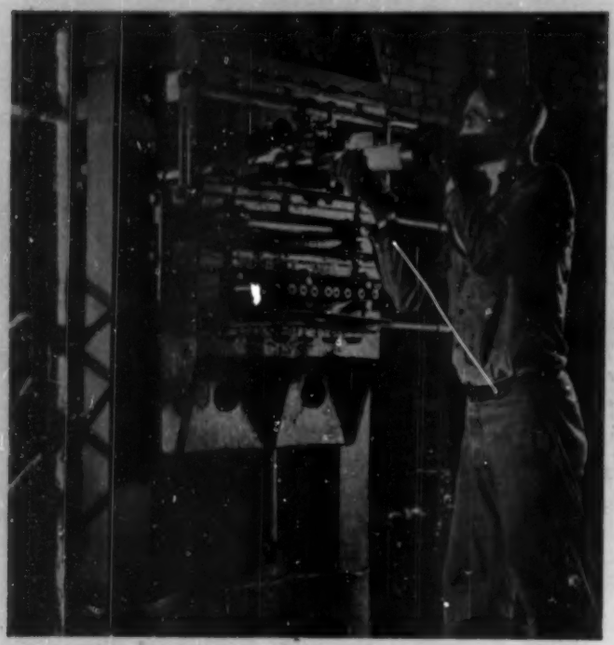
TABLE 4. TENSILE STRENGTH, HARDNESS AND WATER ABSORPTION OF PHENOLIC LAMINATES AFTER EXPOSURE AT 225 to 250 DEG. F. FOR 10 MONTHS

All specimens stabilized by exposure for 24 hours at 280 deg. F.

Grade of phenolic laminate	Thickness	Rockwell M scale hardness — After 24 hr. at 280°F.	Rockwell M scale hardness — After 10 mos. at 225°-250°F.	Tensile strength — After 24 hr. at 280°F.	Tensile strength — After 10 mos. at 225°–250°F.	Tensile strength — Decrease in strength	24 hr. water absorption — After 24 hr. at 280°F.	24 hr. water absorption — After 10 mos. at 225°–250°F.	24 hr. water absorption — Increase in absorption	Remarks on condition of specimens after 10 months at 225°–250°F.
	in.			lb./sq. in.	lb./sq. in.	percent	percent	percent	percent	
XX natural	1/8	112	110	18,800	11,500	39	0.61	1.12	84	Usable
C natural	1/8	106	30	9,200	970	89	3.25	14.3	340	Extremely brittle; not usable
AA natural	3/16	105	81	11,600	7,350	37	1.44	7.85	445	Usable
Glass base natural	3/16	100	80	9,025	5,700	33	2.98	9.44	217	Usable

terials, though their superior temperature characteristics do not always outweigh other specifications on which the selection of phenolic laminate may depend.

Naturally, as with all other compositions, the optimum of all the properties cannot be obtained in any single compound. Certain properties must be sacrificed in order to obtain others, but by constant research and development, many of these "optimum" cases are being approached to an astounding degree; thus broadening and enlarging the field of plastics.



Left—Molding laminated plastic tube sections (mandrels of tightly wound layers of impregnated paper or fabric.) Above—After heat treatment, tubes are ground to exact outside diameter

TABLE 5.—STANDARD SPECIFICATIONS OF THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION FOR PHENOLIC LAMINATED PRODUCTS BASED ON A.S.T.M. TEST METHODS. (SEE N.E.M.A. PUBLICATION NO. 39–57, NOVEMBER 1939)

N.E.M.A Designation	Base material	Water Absorption[a] at 25 °C. ± 2 deg. in 24 hr., percent		Compressive strength[b] (flatwise), lb. per sq. in.		Flexural strength,[b] lb. per sq. in.		Tensile strength,[b] lb. per sq. in.		Dielectric strength[a] at 21 deg. C., volts per mil				Dielectric constant[b] at 10^6 cycles and 21 °C.		Power factor[b] at 10^6 cycles and 21 °C.		Dielectric loss factor[b] (power factor × dielectric constant)	
										Short time		Step by step							
		Maximum	Average[c]	Minimum	Average[c]	Minimum	Average[c]	Minimum	Average[c]	Minimum	Average[c]	Minimum	Average[c]	Maximum	Average[c]	Maximum	Average[c]	Maximum	Average[c]
X	Paper	6.0	4.0	None	35,000	16,000	21,000	9,000	12,500	500	700	300	500	None	..	None	....	None	...
P	Paper	5.0	3.0	None	22,000	11,000	15,000	6,000	8,000	500	700	300	500	None	..	None	....	None	...
XX	Paper	2.0	1.3	None	34,000	12,000	16,000	6,000	8,000	500	700	300	500	5.5	5.0	0.045	0.040	0.25	0.20
XXP	Paper	2.0	1.3	None	25,000	12,000	16,000	6,000	8,000	500	700	300	500	5.5	5.0	0.045	0.040	0.25	0.20
XXX	Paper	1.2	1.0	None	32,000	12,000	15,000	5,000	7,000	500	650	300	450	5.2	4.8	0.035	0.032	0.18	0.15
XXXP	Paper	1.2	1.0	None	25,000	12,000	15,000	5,000	7,000	500	650	300	450	5.2	4.5	0.030	0.027	0.16	0.12
C	Fabric[d]	4.4	3.0	35,000	38,000	16,000	20,000	7,500	9,500	None	200	None	120	None	7.0	None	0.10	None	0.70
CE	Fabric[d]	1.8	1.5	34,000	36,000	13,000	17,000	6,500	8,000	400	500	240	300	6.0	5.5	0.065	0.055	0.40	0.30
L	Fabric[e]	2.5	2.0	30,000	35,000	15,000	20,000	7,000	9,000	None	200	None	120	None	7.0	None	0.10	None	0.70
Le	Fabric[e]	1.8	1.2	33,000	37,000	15,000	19,000	6,500	8,500	400	500	240	300	5.5	5.0	0.055	0.045	0.30	0.22
A	Asbestos paper	1.5	1.25	None	36,000	None	16,000	None	8,000	None	225	None	135	None	..	None	....	None	...
AA	Asbestos fabric	1.9	1.5	35,000	38,000	16,000	20,000	8,000	10,000	None	...	None	...	None	..	None	....	None	...

[a] These values are for material of 1/16 in. thickness; for thicknesses other than 1/16 in. consult N.E.M.A. Publication No. 39–57.
[b] These values are for material of 1/16 to 1 in. thickness.
[c] Average values are given solely for purposes of comparing with other grades or materials.
[d] Cotton fabric weighing over 4 oz. per sq. yd.
[e] Cotton fabric weighing 4 oz. or less per sq. yd.

Synthetic resin emulsions

by DR. H. C. CHEETHAM*

SO-CALLED "water paints" have been known and used for many years. They include many types, such as calsomine, distempers, and a host of formulations based on casein, soybean protein, and water soluble gums. More recently, other water-soluble synthetic binders, such as methyl cellulose, polyvinyl alcohol, and derivatives of polyacrylic acid have received attention. In general, such paints have been formulated with relatively high inert pigment ratios, and their water-sensitivity has limited their applications to interior use or wherever water-resistance was of no serious consequence.

Additions of oil, varnish, soluble resins, soaps, waxes, etc., have been made in efforts to improve the life and protection afforded by such paints, but with comparatively little success. Water-insoluble ingredients, such as oil and varnish are incorporated in such a manner as to yield an emulsion of the oily phase in the aqueous vehicle. In general such formulations yield non-homogeneous films suffering from the same defects as those made from the non-modified aqueous vehicle, namely, water-sensitivity and poor durability.

In contrast to such "water paints" are the synthetic resin emulsion paints, such as those prepared from alkyd resin, which have received much attention in recent years, and as a result of extensive tests are now enjoying rapidly increasing use and popularity. Resin emulsion paints differ quite radically from "water paints" as described above, in spite of the fact that water is used as the solvent to facilitate film formation. In the first place, a properly prepared resin emulsion is a unique product in that it yields homogeneous, clear, tough films of resin on evaporation of water. The preparation of such an emulsion involves the selection of the proper types of alkyd resin, emulsifying, stabilizing, and wetting agents, as well as specific emulsification technique, so that the resulting product will be stable, particularly with pigments; water-resistant; durable; and capable of being applied easily to various types of surfaces. There must be no rolling under the brush, sagging, re-softening on recoating, or other defects apt to be found in poorly formulated vehicles. With certain specific alkyd resins emulsified under special, controlled conditions, there is no evidence of separation, spewing, sweating, or oiliness, which usually characterizes the films obtained from the heterogeneous oil- or resin-containing compositions described above. This difference probably accounts for at least one of the advantages of alkyd resin emulsions, namely, good adhesion even to previously painted surfaces. It also means that the pigment binder is a homogeneous, water-resistant resin. This fact accounts for the observation that alkyd resin emulsions are incapable of binding efficiently any more pigment or extender than an equivalent quantity of the same type of resin laid down from a solvent paint. Efforts to *load* these (*Please turn to page 94*)

* Director of Research, Resinous Products & Chemical Co., Inc.

***1**—Quick-drying, odorless, washable resin emulsion paint assures pleasant occupancy of redecorated hospital ward within a short time.* ***2**—A rough, thirsty stucco was made weather-resistant and* ***3**—a huge building at the New York World's Fair rapidly covered and beautified with Aquaplex water-soluble paint*

History of plastics and their uses

by Dr. GORDON M. KLINE

This article is the third and concluding part of a comprehensive survey tracing the chronological development of plastics in this country, outlining the special properties, methods of molding and fabricating and important uses made of these plastics, particularly in the automotive and aircraft field. The paper was originally presented before the Passenger Car Body Session at the Annual Meeting of the Society of Automotive Engineers on Jan. 17, 1950. The first two parts appeared in our July and August issues.

Methods of molding

"For all plastics like rubber, Celluloid, resins, etc., the molding problem is a very important one. Several substances which otherwise might be very valuable are useless now because they cannot economically be molded. . . . The addition of camphor and a small amount of solvent to cellulose nitrate was a masterstroke, because it allowed quick and economic molding. In the same way white sand or silica would be an ideal substance for a good many purposes, could it be easily compressed or molded into shape and into a homogeneous mass. But it *cannot;* and therefore remains worthless. And that is the main difference between a *plastic* and a *non-plastic.*" These words of Dr. Baekeland,[51] spoken in 1909, emphasize the importance of the molding phase of the plastics industry to its general progress. Fortunately the art of molding has received the attention of inventors quite as much as have the plastic materials during the past thirty years and these advances have been important factors in the increased use of plastics by the automotive industry. A brief review of these developments will, therefore, be presented as the concluding section of this paper.

Compression molding

The discovery of the fundamental principle involved in the operation of the hydraulic press is generally conceded to have been made by Pascal in 1653. The adaptation of this principle to a practical machine is credited to Bramah in 1795. Little industrial use was made of it until after the discovery of the vulcanization of rubber by Goodyear in 1839. A simple hydraulic press of rod-type, between the platens of which a two-piece mold was inserted and removed by hand, was developed for handling the manufacture of rubber

51. Ind. Eng. Chem., *1*, 149–161 (1909).

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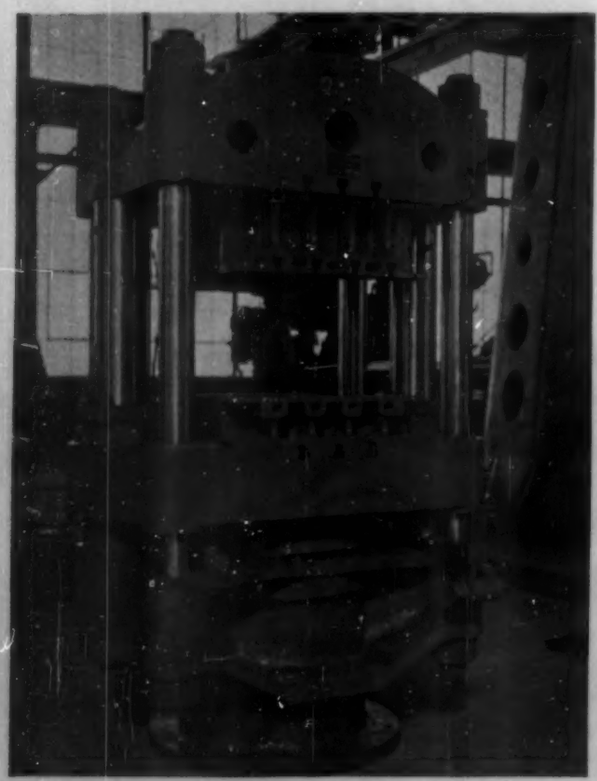

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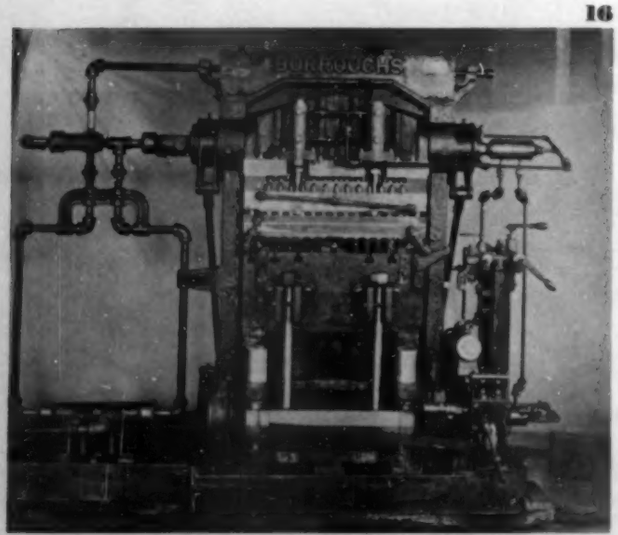


An early model compression molding press of the tilting head type, the machine below was made by Burroughs Engineering Co. (Photo courtesy Bakelite Corp.) Rod-type, semi-automatic press at left, used in conventional compression methods, is by Lake Erie Engineering Corporation

17—*Fully automatic self-contained 50-ton compression molding machine by Watson - Stillman Co.* **18**—*This automatic press by F. J. Stokes Machine Co. has a built-in automatic "unscrewing device" for rapidly producing threaded plastic parts, such as ferrules, knobs, bottle caps and bushings*

17

18

products and was subsequently employed for molding the thermoplastics, pyroxylin and shellac. This elementary design of "hand-molding" press was used for some seventy years without appreciable change other than the substitution of solid side frames in place of rods, and it is still employed for production jobs in which the quantity of molded pieces required is very limited and for which the mold is light enough to be handled manually.

The advent of the phenolic thermosetting resin in 1909 provided the stimulus for introducing features in the compression molding press which would increase the output from a given mold. The semi-automatic press was developed in which the molds were mounted on the platens, thus providing for their mechanical opening and closing. Pins were also provided which automatically ejected the piece from the mold. In later stages the application of, first, a low closing pressure and, thereafter, the requisite high molding pressure was handled automatically, as was also the timing of the pressing operation. However, manual removal of the ejected piece, cleaning of the mold, and loading of the plastic into the die cavities still requires the attention of an operator in this type of press. This semi-automatic press is still the main item of equipment for compression molding in most molding plants in this country.

A variation in the semi-automatic compression molding press was introduced about 1918 to meet the requirements of molding parts with metal inserts. Loading and inspection of inserts in the half of the mold attached to the upper horizontal platen was a time-consuming and inaccurate job. A movable upper platen was developed which presents the top die in a vertical, easily accessible position and makes the placing of inserts a relatively simple matter. This tilting-head type of press ordinarily uses long narrow platens to reduce the necessary movement of the ram to open it and to facilitate loading. The convenience and visibility provided by the tilting-head press have in many instances justified its selection for general purpose molding as well as for the special job of insert molding.

Realization of the fully automatic compression molding press has come about only in the last two years, largely as a result of the competition of the speedier and automatic injection molding units. Firms which have developed equipment for automatic compression molding include the F. J. Stokes Machine Co., the Watson-Stillman Co., the Closure Division of the Owens-Illinois Glass Co., and the Boonton Molding Co. These presses perform all the operations of routine molding of thermosetting plastics, consisting of measuring the charge of molding powder, preheating it, loading it into cavities, closing the mold, opening it slightly for "breathing," i.e., expulsion of gases, closing it again for a pre-determined curing period, opening the mold, ejecting the finished pieces, blowing flash from the cavities and plungers, and then repeating this cycle hundreds and thousands of times with the only manual labor required being to keep the hopper supplied with the molding powder.

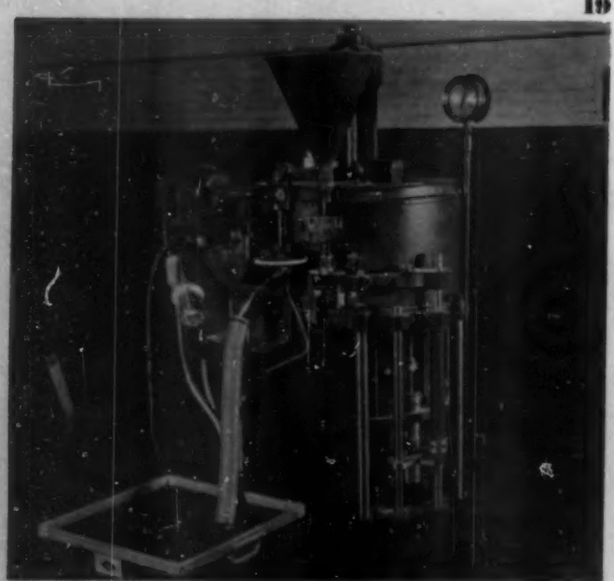
The Stokes Machine Co. has two models available in automatic compression molding machines. One is the small, electrically driven, 15- or 25-ton capacity mechanical press for small parts and limited quantities. The other is a conventional hydraulic-type machine designed to use two sets of multi-cavity molds. While the material in one mold is being pressed and cured, the other mold is outside the platens of the press for

ejection of the molded parts and reloading with molding compound. The Watson-Stillman machine has both horizontal and vertical rams so that split molds can be used without special handling. The force plugs are raised with the vertical ram and the die cavity is opened by the horizontal ram. The vertical ram can also move laterally so that when molded parts are loosened from it, they fall clear of the stationary half of a split mold. The base of the press contains an oil reservoir, cooling coils, and a pump of the double unit type to supply large-capacity low pressure and small-capacity high pressure. The Owens-Illinois Glass Co. has developed the Lauterbach rotary automatic press, modeled basically after the rotary preforming presses in common use, but carrying under each die individual hydraulic cylinders which are operated from a central power well. The loading, curing, and discharge of each mold are completed in one revolution. The Boonton Molding Co. uses a standard compression molding press and adds automatic feed, control, ejection, and mold-cleaning equipment, including a device to automatically remove the flash from the molded part.

These automatic compression molding machines, arriving about 100 years after the initial industrial use of the hydraulic press, represent a revolutionary advance in the plastic molding field. They not only reduce the labor cost but they eliminate the human errors that give rise to faulty moldings. Controlled preheating and exact timing of the cure of the resin produce molded parts of greater uniformity of dimension and superior mechanical, chemical, and electrical properties. The reduction to a minimum of the initial investment in presses and molds required for a given output and of the percentage of rejects means lower unit costs and hence an increase in the number and types of parts that can profitably be molded of plastics.

19—*Rotary automatic press by Lauterbach developed by Owens-Illinois Glass Co. for production of closures*

19

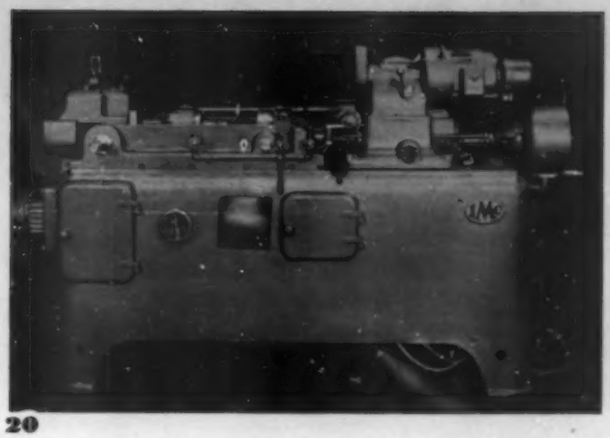


Injection molding

The industrial history of the injection molding machine in the United States is only about five years old, a fact which seems almost incredible when one looks at the huge 1939 model capable of taking a mold 3 by 4 feet in cross section and turning out four 36-ounce moldings every minute. The need for the injection molding machine came with the commercial development in 1929 of the heat-stable thermoplastic molding material, cellulose acetate, which required an uneconomical chilling period when molded by conventional compression methods. The cellulose acetate plastic, however, could be kept hot for a relatively long period in a heating chamber and injected hot into a cold mold, wherein it cooled in a few seconds to a temperature at which it would maintain its shape and hence could be ejected from the mold. At the close of 1935 there were approximately 75 injection molding machines in use in this country, many of them importations from Germany. By July 1, 1937, this number had increased to about 275. According to a communication recently received from Mr. Kennedy of the Carbide and Carbon Chemicals Corp., there were 371 injection molding machines operating in American plants as of December 31, 1938, and 574 as of December 11, 1939, an increase of over 200 machines in the one year, 1939.

The original conception of the injection molding principle is commonly attributed to E. Pelouze, who in 1856 developed a die-casting machine for forcing molten metal into a die by mechanical or hydraulic means. Its first application to plastics was covered by a patent[52] issued to the Hyatt brothers in 1872 for a machine for the extrusion of *Celluloid*. This machine embodied in its heating cylinder many of the same principles that are employed in the design of heating cylinders on present-day machines. Owing to the hazards and deterioration involved in subjecting cellulose nitrate to heat and pressure for prolonged intervals the use of this machine for molding pyroxylin articles was not successful. The next phase of the development of the injection molding press took place in Germany, and in the early thirties several patents were issued for such devices. One of them was issued in 1931 to H. Buchholz[53] for "the process which comprises heating the material to be molded until the same acquires flowing characteristics, then forcing said material directly from the point of heating through a relatively restricted passage under pressure to increase its flowing characteristics, and in this condition forcing it into the mold and cooling the mold during the introduction thereto of the fluid material," and for a machine for carrying out this new method. A second patent of fundamental importance was that of H. Gastrow[54] issued in 1936, which described the heating cylinder used on the Isoma machine, the German-made press which introduced modern injection molding of plastics to the American market. These first machines had an injecting capac-

52. U. S. P. 133,229.
53. U. S. P. 1,810,126.
54. U. S. P. 2,057,945.



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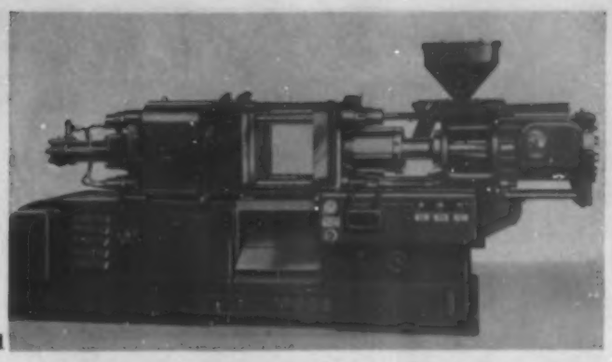

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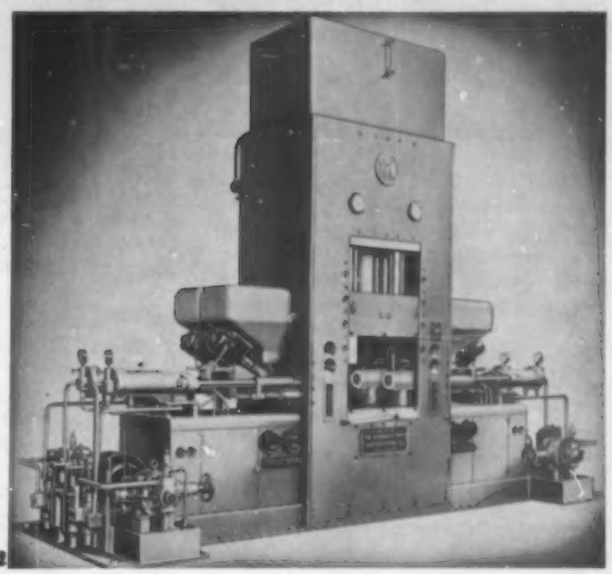

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Modern injection molding was introduced to America by the Isoma line, an early model of which is shown (**20**). (*Photo courtesy Index Machinery Corp.*) **21**—*Typical standard type injection machine, this Reed-Prentice 8-oz. model operates manually or automatically.* **22**—*This huge H-P-M multiple cylinder press of 36-oz. capacity allows mass production of large thermoplastic products*

ity of only $^1/_2$ to $1^1/_2$ ounces per cycle and were suitable only for the molding of small articles, such as buttons, pocket combs, and costume jewelry. The demands of molders in this country for machines of increased capacity and sturdier construction to be used for turning out parts for industrial applications led domestic press manufacturers to construct injection molding machines with radical changes in the design of the heating cylinders, spreading devices, injection plungers, and clamping devices. All of these machines are self-contained so far as heating and pressure pump units are concerned, and have control systems which make possible automatic, semi-automatic, or manual operation. The heating is accomplished either directly by electric heaters, indirectly by oil which is electrically heated, or by utilizing the main body of the heating cylinder as the core of an induction coil.

The capacity of the single-cylinder injection machines was stepped up to 2 to 4 ounces per injection in 1936, 6 ounces in 1937, 9 ounces in 1938, and 12 ounces in 1939. The 40 square inches of projected area of a molded part possible in 1937 was jumped to 100 square inches in 1939. By combining several of these cylinders each feeding into a different inlet in the same mold, parts of considerable size weighing up to 36 ounces can be produced. These multiple-unit injection presses are used in particular for producing automobile parts, such as steering wheels, instrument panels, glove compartment doors, and window frames. In fact, it was stated recently that "Presses of suitable type have already been developed with die space ample to take molds as large, for example, as the entire side of an automobile."[55]

55. H. F. MacMillin, Modern Plastics, *17*, 366–72 (Oct. 1939).

Transfer molding

The injection molding of thermosetting resins is complicated by the fact that these materials remain plastic at elevated temperatures for only a short interval because of thermal acceleration of chemical reactions which convert the resins to hard, infusible masses. This necessitates the careful restriction of the maximum plasticizing heat to only the approximate quantity of molding compound needed for each discharge into the mold. In practice, this has meant actual loading of the heating chamber with only that amount of material needed for each cycle. The process also differs from injection molding of thermoplastics in that the mold itself is kept hot all the time to complete the transformation of the resin to the cured state.

The molding of thermosetting resins by their injection in a plastic state into a hot mold has been called *Transfer Molding* by the inventors of the process in this country. According to the patents,[56] transfer molding comprises the steps of plasticizing the resins by contact with the heated surfaces of a pressure chamber, flowing the material through a narrow passage where further heating may (*Please turn to page 90*)

56. L. E. Shaw, U. S. P. 1,916,495; July 4, 1933; L. E. Shaw, U. S. P. 1,919,534; July 25, 1933; E. E. Novotny, U. S. P. 1,993,942; Mar. 12, 1935; E. E. Novotny, U. S. P. 1,997,074; Apr. 9, 1935.

Plastics Digest

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them. Requests for copies of the magazines mentioned should be directed to the individual publishers whose addresses will be mailed upon receipt of a self-addressed stamped envelope.

General

PLASTICS IN BRITISH PLANES. Aviation *39*, 44–5+ (July 1940). The British Air Ministry recently sent a circular letter to aircraft manufacturers instructing them to use plastics wherever possible in place of light alloys for lightly stressed as well as unstressed parts. One British bomber employs acetate sheeting and tubing for 22 different uses. Acetate tubing is being increasingly preferred to metal ones on account of their lightness in weight and ease of fabrication and installation. Great Britain is assured of sufficient acetate for her requirements *provided there is no drop in imports of Rhodoid from France*. Practically the whole of the I.C.I. output of methyl methacrylate resin is earmarked for the R.A.F. Tools and dies for turning out aluminum, aluminum alloy, and steel sheet pressings are being made of *Jabroc* which consists of laminated resin-impregnated veneers of Canadian beech.

WILL PLASTICS DISPLACE METALS? Herbert Chase. Metals and Alloys *11*, 157–62 (June 1940). The two types of materials are basically different and consequently their uses seldom overlap or become competitive. Plastics are usually more expensive than metals, even on a part-for-part basis. Plastics lack the strength to be substituted for metals save perhaps for a few small parts which, even then, are likely to require metal reinforcement. A third consideration cited by the author is the time required and cost involved in molding, especially of large plastic parts, as compared with the rapid stamping of steel or the die casting of zinc and of aluminum alloys. The author considers the increasing number of applications of plastics in aircraft construction as exceptional rather than indicating a trend toward further structural applications of plastics in lightly stressed parts.

AERMOLD TRAINER. Aviation *39*, 56–7 (July 1940). Actual factory tests have proved this wood-plastic material to be more resistant to shock and to fire than sheet aluminum alloy material of comparable strength. Work is going forward on engineering other planes incorporating the plastic process.

UTILIZATION OF WASTE LIGNIN. E. E. Harris. Ind. and Eng. Chem. *32*, 1049–52 (Aug. 1940). Research on the fundamental chemistry of lignin from waste products is aiding in the solution of this problem. The development of uses closely allied to the function of lignin in the tree has resulted in several types of plastics.

Materials and Manufacture

COLOR AND QUALITY OF MOLDINGS. E. M. Efimova. Org. Chem. Ind. (USSR) *7*, 237 (1940). Lithopone must be compounded with lime to give pale and medium colors in novolak type resins. When the plastic composition contains lithopone and no other pigment the fluidity is always greater than without lithopone. For light color and good flow behavior it is best to use 20 parts by weight of lithopone and 2 parts of lime. Magnesium oxide is less favorable than lime for lightness of color and also for resistance to hot water. Test moldings were made with the recommended proportions of lithopone and lime, colored with rhodamine B, safranin, Lake Orange, Brilliant Green, and Acid Orange 2B to ascertain the influence of the pigments on the color of the moldings.

(Translation available from Hooker Scientific Library, Central College, Fayette, Mo.)

PULP, PAPER, AND PLASTICS. J. Grant. Plastics *4*, 122–4, 146–8, 170–2 (May, June, and July 1940). A series of articles dealing with the nature and manufacture of paper and pulp and the uses of these materials in plastics. Laminated, impregnated, and surface-coated products, fibrous fillers for plastics, and treatment of paper pulp are considered.

PLASTICIZERS FOR CELLULOSE ACETATE AND CELLULOSE ACETATE BUTYRATE. C. R. Fordyce and L. W. A. Meyer. Ind. and Eng. Chem. *32*, 1053–60 (Aug. 1940). See MODERN PLASTICS *17*, 82 (May 1940) for abstract of this paper.

Molding and Fabricating

PRACTICAL MOLDS FOR PLASTICS. G. P. Lehmann. Am. Machinist *84*, 489–92 (July 10, 1940). The seven principal types of molds in use in the plastics industry are flash, landed plunger, loading plate, straight plunger, injection, transfer, and subcavity. The last one is not in common use because it is uneconomical in molding material. Hints on proper design of molds to prevent annoyance and loss to the molder are presented.

Applications

PLASTICS AS CONSTRUCTIONAL AND ENGINEERING MATERIAL. H. V. Potter. Trans. Inst. Plastics Ind. (London) *9*, 43–64 (July 1940). A review of commercial plastics and their applications in the building trade, shipbuilding, railway engineering, silent and corrosion-resistant gears, roller mill bearings, vacuum cleaner parts, pile-driver dollies, automobile and aircraft parts, tool handles, electrical engineering, chemical engineering, and various miscellaneous fields.

VISUAL STRESS ANALYSIS. E. W. P. Smith. Steel *106*, 60 (June 24, 1940). Use of polarized light and cellulose nitrate plastic models affords means of direct visual comparison of stress distribution in different joints with no mathematical work and with simple equipment.

THE USE OF ACRYLIC RESIN FOR JACKET RESTORATION. L. W. Harris. Dental Digest *46*, 198–201 (June 1940).

THE CASTING OF PLASTIC INLAYS AND CROWNS. W. E. Wilson. Dental Digest *46*, 202–4 (June 1940). Two applications of plastics in dentistry are described in this and the foregoing reference. Further extension of the use of plastics in this field is forecast.

PRESENT TREND OF TEXTILE FINISHING. T. H. Roberts. Am. Dyestuff Reporter *29*, P396–9 (Aug. 5, 1940). A discussion of the applications of cellulose derivatives and urea-formaldehyde, alkyd, and methacrylate resins in textile finishing.

Chemistry

SUGGESTED SYSTEM FOR CLASSIFICATION OF POLYMERS. H. Mark. India Rubber World *102*, 49–51 (July 1940). High polymers are classified according to the ternary system used in metallography for alloys. The following three types of simple unsaturated organic compounds are the essential components of a high polymer of the ternary type. One bifunctional component which contains two unsaturated bonds or groups, such as butadiene, introducing the possibility of obtaining cross-linkages, of being vulcanizable, and of reacting with fillers and activators through residual unsaturation. One monofunctional softening component, such as isobutene, acrylic ester or vinyl acetate, introducing into the copolymer high elasticity, flexibility, and plasticity and apparently making direction and control of the process easier. One monofunctional hardening component, such as styrene, acrylonitrile, vinyl chloride, or methacrylic esters, introducing toughness and hardness and facilitating the process of polymerization. The variation of the properties of such polymers with composition is presented graphically

Filling a big order

THE Tenite housing for this Uarco sales register is one of the largest plastic units ever molded by injection.

Its successful production is due to the excellent molding properties of Tenite combined with skillful mold construction. The Tenite flows freely into the mold cavity—welds securely around the metal reinforcements—and sets almost instantly by cooling.

Removal of the sprue scrap is the only finishing required. The housing is light in weight and practically unbreakable—its color, being a part of the Tenite, cannot chip, peel, or wear off.

High-speed production, made possible by injection molding Tenite, is enabling scores of manufacturers to cut costs and keep pace with large orders. The many properties and uses of Tenite are described in a 28-page book, illustrated in color, which will be sent on request.

• • •

TENITE REPRESENTATIVES: *New York*, 10 East 40th St. *Buffalo*, 1508 Rand Building. *Chicago*, 2264 Builders' Building. *Detroit*, 904-5 Stephenson Building. *Leominster, Mass.*, 39 Main St. . . . Pacific Coast: Wilson & George Meyer & Company—*San Francisco*, Federal Reserve Building; *Los Angeles*, 2461 Hunter St.; *Seattle*, 1020 4th Ave., South.

TENITE *an Eastman plastic*

TENNESSEE EASTMAN CORP., KINGSPORT, TENN., *Subsidiary of the Eastman Kodak Co.*

Tenite housing molded by Sinko Tool & Mfg. Co. for United Autographic Register Co.

U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each.

GLYCOL RESIN. C. Ellis (to Ellis-Foster Co.). U. S. 2,206,171, July 2. Condensing a glycol with maleic acid or a derivative thereof and with mixed drying oil fatty acids to form a soluble resin which can be insolubilized by oxidation.

PHONOGRAPH RECORD. J. H. Hunter (to Radio Corp. of America). U. S. 2,206,636, July 2. Use of chromic acid (very finely powdered) as filler in plastics for molding sound records.

POLYSULPHIDE PLASTICS. J. C. Patrick. U. S. 2,206,641; J. C. Patrick (to Thiokol Corp.). U. S. 2,206,642–3, July 2. Condensing a reactive methylene compound with an alkali metal tetrasulphide; adding a tetramethylthiuram sulphide to such a product to make a heat-curing composition; and forming a cement by dissolving such a plastic in an organic solvent.

PLASTIC LENSES. Wm. E. Williams. U. S. 2,206,797, July 2. Dies for molding synthetic resin lenses are made with extreme precision so that the lenses will exactly fit the eye.

CASEIN PLASTICS. J. A. Parsons (to American Plastics Corp.). U. S. 2,206,850, July 2. Humidifying plasticized casein in sheets or strips to improve its properties.

CAST RESINS. Karl Loos. U. S. 2,206,906, July 9. Separately condensing acetone, phenol (with a basic catalyst) and urea with formaldehyde, boiling the mixed condensation products, acidifying with an organic acid and distilling to form a hardenable resin.

COFFEE BEAN PLASTIC. Herbert S. Polin. U. S. 2,207,069, July 9. Removing carnaubic, palmitic and daturic acids from coffee beans and heating the residue with water under pressure at a high temperature to form a molding composition.

ARTIFICIAL BRISTLES. H. A. Neville and Wm. C. Forbes (to Devoe and Raynolds Co.). U. S. 2,207,156–7–8, July 9. Dipping strands of textile fiber in a resin solution, allowing the solution to drain down the strands, drying, dipping again, drying again and baking to form bristles; forming such resin-coated strands so that they have a taper which is a composite of the tapers of individual parts of the strand; and using cellulose, a polyamide resin or a vinyl formal resin in making the bristles.

SOLUBLE RESIN. Israel Rosenblum. U. S. 2,207,384, July 9. Condensing alkylphenols (butylphenol or higher) with formaldehyde in presence of a terpene.

TRANSFER PAPER. G. von Kujawa (to General Aniline & Film Corp.). U. S. 2,207,388, July 9. Use of a resinous condensation product from phenoxyacetic acid and formaldehyde as interlayer between the paper back and the emulsion face of photomechanical transfer paper.

THERMOPLASTIC MOLDING. J. Bailey (to Hartford-Empire Co.). U. S. 2,207,426, July 9. Apparatus for flash melting a plasticized cellulose acetate composition, cooling it to a temperature range which avoids decomposition while retaining plasticity, and bringing it to a constant molding temperature.

DICYANDIAMIDE RESIN. K. Ripper (to American Cyanamid Co.). U. S. 2,207,442, July 9. Condensing dicyandiamide with formaldehyde in presence of a sulphate, nitrate or chloride of a metal such as copper, zinc, lead, tin, barium or mercury to form a water-repellent resin.

POLYSTYRENE COATING. T. A. Kauppi and K. D. Bacon (to Dow Chemical Co.). U. S. 2,207,623, July 9. A fast-drying, low-viscosity finish containing polystyrene in a blend of aromatic and aliphatic solvents.

HEAT-SETTING RESINS. D. D. Lee; I. E. Levine and D. D. Lee (to Standard Oil Co. of California). U. S. 2,207,624; 2,207,626, July 9. Condensing furfural with a saturated hydroxynaphthenic acid, or other saturated hydroxycarboxylic acid, to form a thermosetting resin.

SULPHONAMIDE RESIN. J. W. Hill (to E. I. du Pont de Nemours and Co.). U. S. 2,207,803, July 16. Condensing cyclohexane sulphonamide with formaldehyde to form a resin.

VARNISH RESIN. Laszlo Auer. U. S. 2,207,847, July 16. Blending a rosin-modified alkyd resin with a small proportion of an oil-soluble phenolic resin and a sulphinic or sulphonic acid or acid chloride.

PLASTIC. R. P. Courtney (to Bakelite Corp.). U. S. 2,207,997, July 16. Heating an oil-soluble phenolic resin with tung oil and compounding the product with woodflour in a solvent.

CONTAINER. M. Wagner (to Liquid Carbonic Co.). U. S. 2,208,060, July 16. Making a laminated sheet comprising rubber hydrochloride cemented with varnish to a paper support, for use in containers.

ACIDPROOF RESIN. P. Esselmann, K. Kösslinger and J. Düsing (to I. G. Farb. Akt.). U. S. 2,208,095, July 16. Resins capable of resisting 10% acid or alkali solutions are made by interpolymerizing ethyleneimine with carbon disulphide, carbonyl sulphide, thiophosgene or sulphur chloride.

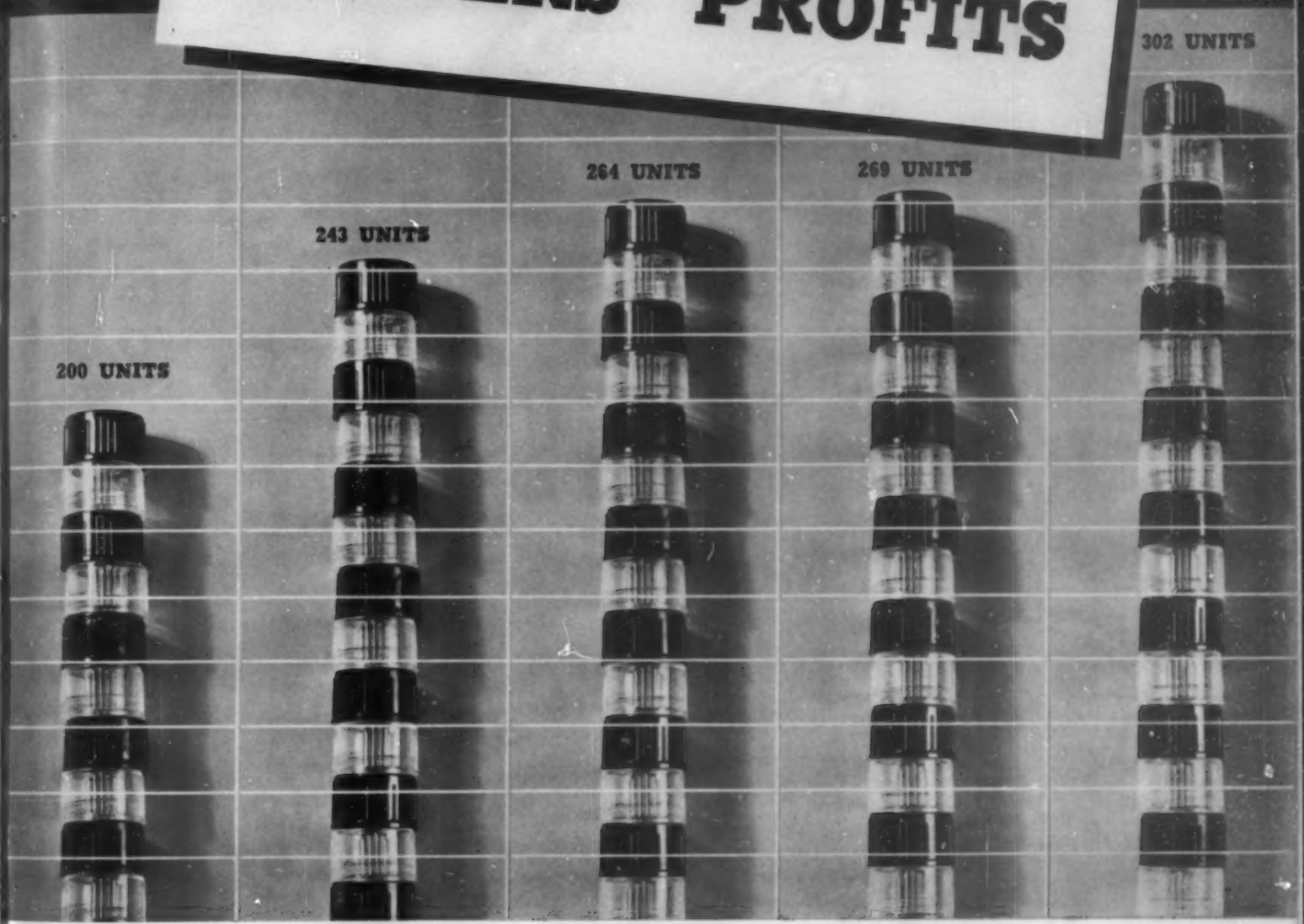
STABILIZED COATING. A. W. Johnson and G. H. Young (to Stoner-Mudge, Inc.). U. S. 2,208,216, July 16. Stabilizing vinyl or acrylate resin coatings with a heterocyclic nitrogen base such as pyridyl chlorophenylethylene, tripyridyl, stilbazole, isopyrophthalone, quinicine, cinchonocine or the like.

STRIPPING FILMS FROM METAL. C. H. Hempel (to Heresite and Chemical Co.). U. S. 2,208,294, July 16. Stripping baked phenolic resin coatings from aluminum or its alloys in a sulphuric acid bath which leaves the metal bright and clean.

TRANSPARENT RESIN. Eustace Glycofrides. U. S. 2,208,290, July 16. Making a clear resin by acid condensation of urea with excess formaldehyde followed by vacuum distillation and thermal hardening.

RUBBERLIKE RESIN. H. G. Kittredge (to Kay and Ess Chemical Corp.). U. S. 2,208,305, July 16. Blending a vulcanized olefin polysulphide resin with an alkyd resin which is modified with a heat-bodied oil. *(Please turn to next page)*

Specific Gravity Influences MOLDERS' PROFITS



PLASTIC A	PLASTIC B	PLASTIC C	PLASTIC D	STYRON
Specific Gravity 1.60	Specific Gravity 1.32	Specific Gravity 1.21	Specific Gravity 1.14	Specific Gravity 1.06

Plastic material "A" may cost less per pound than STYRON* but the graph above clearly indicates how the *dollar value* of plastic materials and thus molders' profits depend on Specific Gravity.

For while a pound of plastic "A" (specific gravity 1.60) may produce approximately 200 moldings, the same amount of STYRON (specific gravity 1.06) would, in comparison, produce more than half as many again or over 302 moldings.

Injection molders are using STYRON, Dow Polystyrene, not only because it has the lowest specific gravity of any commercial molding material, but also because its use allows increases up to 25% in injection molding speeds. STYRON has good dimensional stability, is highly resistant to attack by water, alcohol, acids, and alkalis and is particularly suited to the quantity production of insulating shapes, ornaments, boxes and other forms.

STYRON

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Branch Sales Offices: New York City, St. Louis, Chicago, San Francisco, Los Angeles, Seattle.

*Trade Mark Reg. U. S. Pat. Off.

TERPENE RESIN. T. F. Bradley (to American Cyanamid Co.). U. S. 2,208,321, July 16. Condensing a diterpene with maleic anhydride and esterifying with a glycol, then polymerizing the ester.

ALKYLPHENOL RESINS. J. F. Olin (to Sharples Solvents Corp.). U. S. 2,208,331, July 16. Making oil-soluble resins from mixed di- and polyalkylphenols in presence of a more reactive phenol.

BUTTONS. N. O. Broderson (to Rochester Button Co.). U. S. 2,208,494, July 16. Molding buttons in a relief pattern, filling part of the pattern with pigment and finally molding to a smooth variegated colored surface.

STENCIL COATING. Shinjiro Horii. U. S. 2,208,980–1, July 23. Coating stencil sheets with an initial diamine: dicarboxylic acid condensation product, suitably compounded and used with or without soybean casein.

BAIT. O. Sherer (to Josephine W. Sherer, Oletime Woodsman's Line). U. S. 2,209,096, July 23. Eye feathers for artificial flies are molded from a synthetic product.

ALKYD RESIN. P. K. Frolich (to Standard Oil Development Co.). U. S. 2,209,198, July 23. Modifying alkyd resins with naphthenic acids from petroleum.

POLYMERIZATION ACCELERATOR. W. Bauer and E. Trommsdorff (to Röhm and Haas Co.). U. S. 2,209,246, July 23. Use of Tetralin peroxide as accelerator in polymerizing vinyl, acrylate, methacrylate and like compounds.

LIGNIN RESIN. F. J. Wallace (to Robeson Process Co.). U. S. 2,209,289, July 23. Making a fusible, soluble resin from lignin by condensation with a polycarboxylic acid.

ABRASIVE. J. H. Berger (to American Cyanamid Co.). U. S. 2,209,292, July 23. Bonding solvent-wet abrasive particles with a composition containing an aminotriazine-aldehyde resin.

RESIN RECOVERY. F. W. Corkery (to Pennsylvania Industrial Chemical Corp.). U. S. 2,209,322, July 30. Recovering coumarone and indene resins from their sulphonates by decomposition with sulphuric acid.

PETROLEUM RESINS. E. W. Hultman (to Hultene Rubber Corp.). U. S. 2,209,333, July 30. Making rubberlike resins from petroleum hydrocarbons by action of an acid electrolyzed in presence of a chlorinating agent.

PLASTICIZER. H. B. Smith (to Eastman Kodak Co.). U. S. 2,209,357, July 30. Plasticizing cellulose acetate-propionate or acetate-butyrate with dibutyl sebacate.

SLICER. Jos. Lupo, Jr. U. S. 2,209,412, July 30. A machine for cutting articles from a length of molded plastic material.

SAFETY GLASS. G. B. Watkins and J. D. Ryan (to Libbey-Owens-Ford Glass Co.). U. S. 2,209,435, July 30. Bonding cellulose acetate interlayers to glass with a vinyl acetal resin plasticized with a phthalate ester.

HOLLOW ARTICLES. E. T. Ferngren (to Plax Corp.). U. S. 2,209,877, July 30. Hollow articles with varying wall thickness are formed from a liquid plastic composition by deposition in a mold cavity, the number of coats depending on the wall thickness.

ELECTRIC CABLE. T. R. Scott and J. K. Webb (to International Standard Electric Corp.). U. S. 2,209,894–5, July 30. Forming oilproof barriers in oil-insulated cables by impregnating a portion of the porous insulation with styrene, then polymerizing the styrene.

KETONE RESIN. A. W. Ralston, R. J. Vander Val and S. T. Bauer (to Armour and Co.). U. S. 2,209,903, July 30. Condensing a phenylolalkyl ketone with formaldehyde to form a resin.

INSULATION. P. Nowak and H. Hofmeier (to General Electric Co.). U. S. 2,209,928, July 30. Increasing the compressive strength of oilproof, waterproof, ozone-resisting insulation by compounding a polyacrylate resin with a chloroprene polymer.

SELF-LACQUERED PLASTIC. C. N. Smith (to Carbide and Carbon Chemicals Corp.). U. S. 2,209,940, July 30. Imparting gloss to thermoplastics by contact with a solvent, blended with a nonsolvent to prevent surface embrittlement.

MOLDING COMPOSITION. L. Smidth (to Luco Products Corp.). U. S. 2,209,943, July 30. Blending a dried urea resin with free urea or thiourea to make a molding composition.

COATED PLASTIC. P. W. Felt (to Brown and Bigelow). U. S. 2,210,167, Aug. 6. Lacquering molded cellulose acetate articles with a cellulose acetate solution thinned with alcohol and another nonsolvent for cellulose acetate.

COAL TAR RESIN. Wm. H. Carmody (to Neville Co.). U. S. 2,210,395, Aug. 6. Obtaining a resin from still residues derived from light oils formed in high temperature coking of coal.

PLASTICIZER. L. Rosenthal and W. Becker (to I. G. Farb. Akt.). U. S. 2,210,434, Aug. 6. Plasticizing chlorinated rubber or vinyl chloride resin with high-boiling unsaturates from Edeleanu refining of petroleum.

PRINTING INK. T. A. Martone and C. S. Rowe (to E. I. du Pont de Nemours and Co.). U. S. 2,210,461, Aug. 6. Rotogravure ink containing a resin formed by polymerizing dihydroacenaphthene or dihydronaphthalene.

HARDENED PROTEIN. G. H. Brother and A. K. Smith (to Secretary of Agriculture of the U. S.). U. S. 2,210,481, Aug. 6. Hardening a protein with aqueous formaldehyde and waterglass and dispersing the product in water.

FILM CASING. C. B. Strauch (to Hartford-Empire Co.). U. S. 2,210,509, Aug. 6. Forming a film casing over articles such as bottle caps by heating a defined area in a plastic sheet, forming the heated film around the article and rigidifying that portion of the plastic sheet.

INSULATION. A. L. Brown and L. B. Hill (to Westinghouse Electric & Mfg. Co.). U. S. 2,210,704, Aug. 6. Bonding mica flake insulation with a blend of shellac and 5–20 percent of ethylcellulose.

APPLICATOR CAP. A. B. McGinnis and C. C. Webb (to Wheeling Stamping Co.). U. S. 2,210,766, Aug. 6. A molded applicator cap threaded on the inside has the applicator tip correspondingly threaded to facilitate molding and removal from the mold.

ETHYLENE POLYMER. J. R. Myles and L. L. Bache (to Imperial Chemical Industries, Ltd.). U. S. 2,210,771, Aug. 6. Making films, filaments, tape or tubing from a solution of an ethylene polymer.

ETHYLENE POLYMER. M. W. Perrin, J. G. Paton and E. G. Williams (to Imperial Chemical Industries, Ltd.). U. S. 2,210,774, Aug. 6. Forming staple fiber from a tough ethylene polymer which softens and melts at 100–120 deg C.

Harmony SURE SATISFIES

. . . But you can harmonize without singing a note! You can do it the Elmer Mills way. . . . That's the harmony that gets results . . . gets things done right . . . and on time!

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That's the harmony that satisfies. It's the Elmer Mills way of getting things done right . . . your assurance of better injection molded plastics. So treat yourself to real satisfaction. . . . Tune in with close harmony.

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And here's more harmony! This exquisite door chime housing with cameo decoration adds beauty of appearance to beauty of sound. It is a one-piece, injection molded plastic, engineered and produced by the Elmer E. Mills Corporation, from mold to finished job. Let the Elmer E. Mills Corporation help you on your next plastic job.

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SINGLE INJECTION UNIT

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Injection Pressures: 20,000 or 30,000 lbs.
Clamp Pressures: 60 - 100 - 200 tons

VERTICAL CLAMP
MULTIPLE INJECTION UNITS

Injection Capacities: 16 - 36 ounces or more
Injection Pressures: 20,000 or 30,000 lbs.
Clamp Pressures: 250 - 500 tons or more

INJECTION MOLDING PRESSES are *Built* For Mass Production Molding ★ ★

Part: Window trim. Total wt.—3-¾ ozs.; max. projected area—40 sq. ins. spread out over an area of 22" x 3-¾"; thickness of pieces—¾" on outside edge with connecting bosses on under side protruding ¾" beyond this thickness.

The 200-H-9 H-P-M Injection Molding Press is in popular demand today among plastic molders. Here are the reasons:

1. **Plenty of die clamp force . . . 200 tons pressure, all straightline hydraulic clamp.**
2. **Sufficient injection capacity 9 ozs. material per shot with 20,000 lbs. per square inch injection pressure.**
3. **Ample die space mounting . . . bolster plates 16½" x 24" (horiz. and vert.), daylight 18", shut height 6".**
4. **Positive heat control of material with H-P-M's exclusive circulating fluid heat.**
5. **Controlled feed of material to heating chamber with H-P-M's exclusive positive force feed.**
6. **Efficient pressure generators with H-P-M's exclusive radial, piston type, Hydro-Power pumps.**

Part: Instrument panel piece. Total wt.—4-⅛ ozs.; max. projected area—54 sq. ins. spread out over an area of 19" x 6"; thickness of pieces—⅛" with connecting bosses on under side protruding ¾" beyond this thickness.

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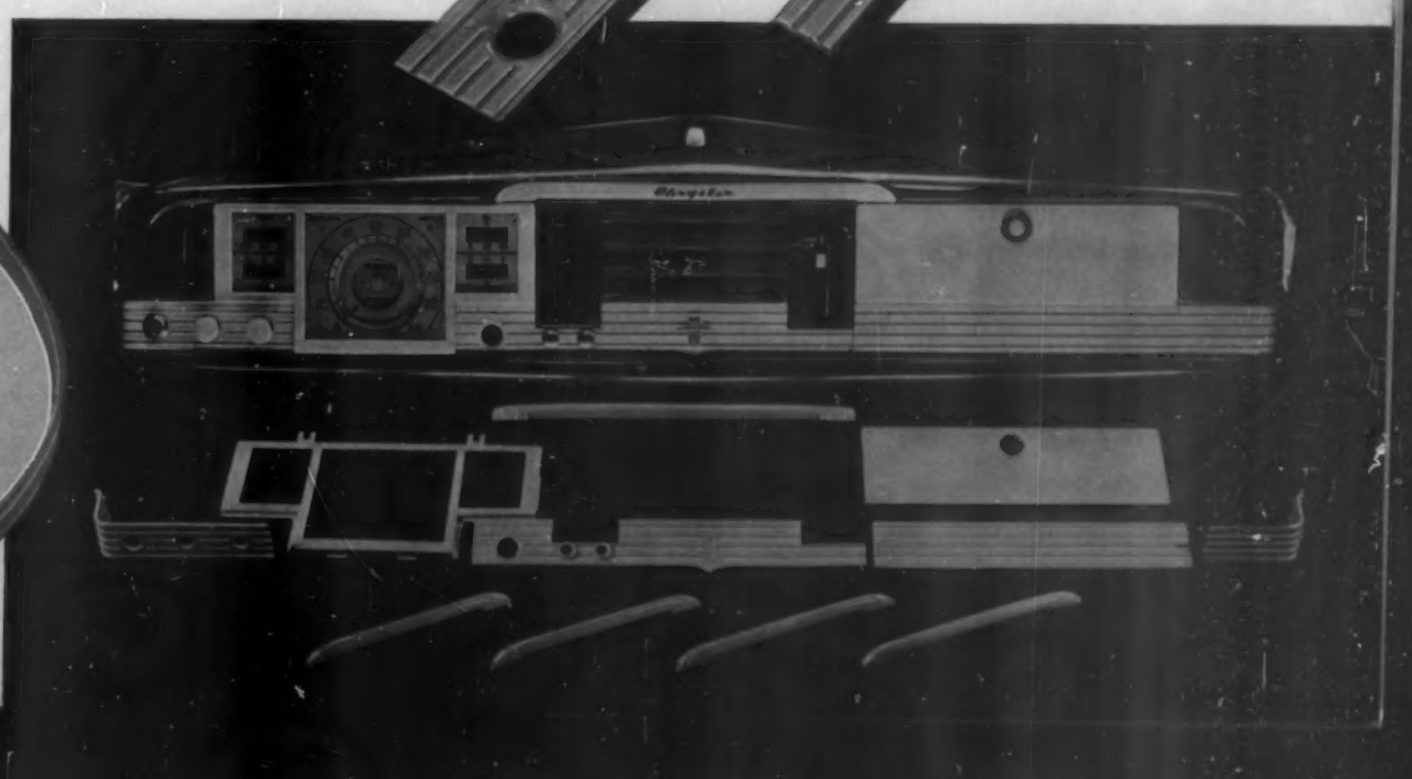

Publications

Write direct to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices.

The Story of Superfinish

by Arthur M. Swigert, Jr.
Lynn Publishing Co., Detroit, Mich., 1940
Price $5.00 **672 pages, 720 illustrations**

The A, B, C's of metal finishing as well as the most advanced technical information are dramatically presented for the engineer, foreman, toolmaker, mechanic, or even the general interest reader who wishes to learn what superfinishing has accomplished in vastly improving the efficiency of bearing surfaces. We heartily concur with the author that "The evolution of *Superfinish* from an idea conceived less than five years ago to the status that it holds today is not only a romance of modern industry, but also an indication of modern industry's thoroughness and speed." Every feature of the book is excellent except the index —evidently hastily put together as an after-thought. G. M. K.

Printing Inks—Their Chemistry and Technology

by Carleton Ellis
Reinhold Publishing Corp., 330 West 42nd St., New York, 1940.
Price $7.00 **560 pages**

The trend in recent years has been toward the production of printing inks composed of or containing substantial proportions of synthetic resins. The author has prepared this book to fill the needs of chemists for a comprehensive treatise dealing with the subject of printing inks in a modern way. Extensive references to the literature, a glossary of special terms peculiar to the printing trade, and over 60 pages of name and subject indexes make this book a valuable source of information on the composition and utilization of inks of various types and on methods of testing the raw materials and finished products. G. M. K.

Chemical Industries

Chemical Publishing Co., Inc., 148 Lafayette St., New York, 1940
Price $4.00 **447 pages**

This is the 14th edition of an English reference book for chemical engineers. Its 8 sections deal with constructional materials, power plant and water treatment, chemical plant equipment, handling and conveying of materials, instruments and laboratory apparatus, raw materials and heavy chemicals, fine chemicals, and mathematical and conversion tables. It is concluded by a bibliography of over 2000 technical books. G. M. K.

● THE DEPARTMENT OF COMMERCE HAS RELEASED a new handbook entitled, "Modern Export Packing" which contains a description of the containers and methods employed in packing chemicals and allied products for export shipment. Governmental requirements in connection with the packing and shipping of chemicals and foreign regulations governing dangerous articles are also discussed. The handbook contains 530 pages and 242 illustrations and is available from the Superintendent of Documents, Washington, D. C., for $1.00.

● CARPENTER STEEL CO., READING, PA., ANNOUNCES its Steel Data book covering applications, tables on corrosion resistance, physical properties, tolerances, weights, sizes and diameters on welded stainless tubing. One section is devoted to practical hints on fabricating stainless tubing, another to design, a third to specifications. It contains 45 illustrations and is available upon request from the Welded Alloy Tube Division, Dept. 105, Kenilworth, N. J.

● BULLETIN ENTITLED "OVER 75 YEARS' EXPERIence" has recently been issued by Reed-Prentice Corp., Worcester, Mass., showing various views within its plant with the facilities for manufacturing engine and toolroom lathes, vertical milling machines, plastic injection molding machines, die casting machines and portable timber saws.

● A 14-PAGE CATALOG ISSUED BY FORMICA Insulation Co., Cincinnati, Ohio, describes the various types of Formica and its many applications. Well illustrated, the catalog shows industrial as well as decorative uses of the laminated plastic. Tables of properties are also included.

● BULLETIN NO. 4007 DESCRIBING HYDRAULIC presses for the process industries has recently been published by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The 6-page booklet illustrates such equipment as, dehydrating, blocking and briquetting presses; forming, molding, extruding and laboratory type presses.

● A NEW EDITION OF THE "PLASTICIZERS AND Resins" bulletin of the Monsanto Chemical Co., Springfield, Mass., has been recently published. It contains specifications and application data for their various products and much useful information and recommendations for incorporation of their plasticizers and resins into plastic and coating compositions.

● METALLIZING ENGINEERING CO., INC., ANnounces the first issue of Metco News, a periodical devoted entirely to developments and applications of its metal spraying process. Those interested in the maintenance, salvaging or manufacture of metal products or equipment may receive this and ensuing issues, without cost, by writing to the company at 21-07 41st Ave., Long Island City, New York.

● LEWIS-SHEPARD SALES CORP., 295 WALNUT ST., Watertown, Mass., announces the publication of a 56-page silver anniversary edition, covering over 1,5 of the most important items from their extensive line of materials handling equipment. Clearly described and pictured are many types of lift trucks, floor trucks, portable elevators, cranes, storage racks, skid platforms, and equipment for specific purposes.

● VOCATIONAL SCHOOL MEN WHO ARE CONFRONTED with the problem of enlarging old shops or planning shops will find much helpful information in a timely publication, "Planning the Industrial Apprentice Training Shop," recently announced by the South Bend Lathe Works, South Bend, Indiana. It contains a number of practical shop layouts planned for really efficient vocational training. Methods of organizing shop work; suggestions for selection of equipment; and lists of tools and accessories for various sizes of industrial apprentice machine shops are included. Most helpful of all, perhaps, is an inquiry form for requesting a shop floor plan layout to be made by the Engineering Department of the South Bend Lathe Works. The floor plan layout service is offered free of charge and without obligation to anyone desiring in planning a machine and shop.

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YOUR packages join the dress parade when DURITE is specified as the material from which they shall be molded. ¶ DURITE, the choice of leaders when called upon to mold for popular sales containers and other more intricate applications, provides strength, modern styling, and a lustrous, permanent finish. ¶ Make *your* product more appealing—more saleable. Write Durite Plastics, the exclusive producers of phenol-furfural resins.

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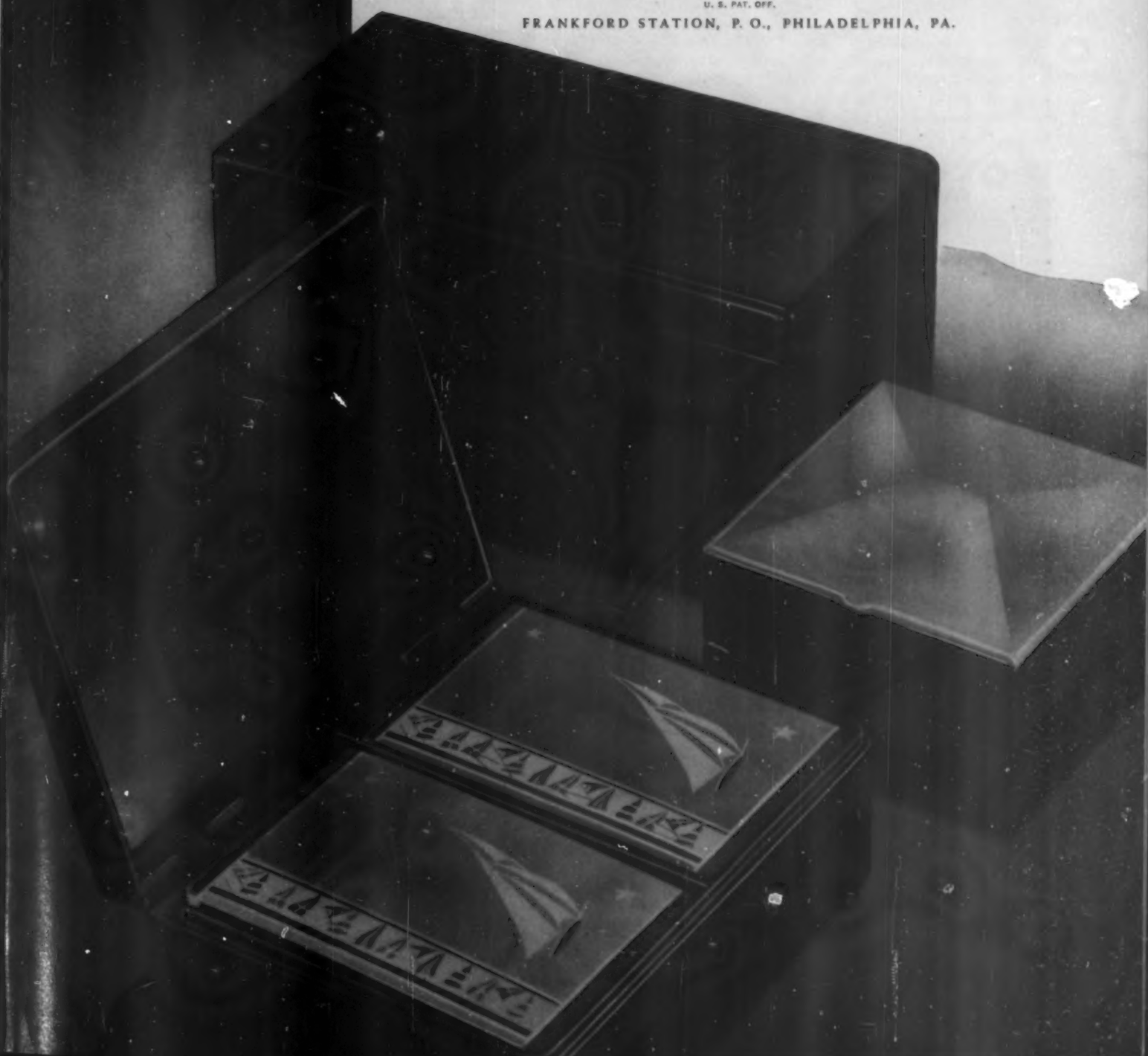
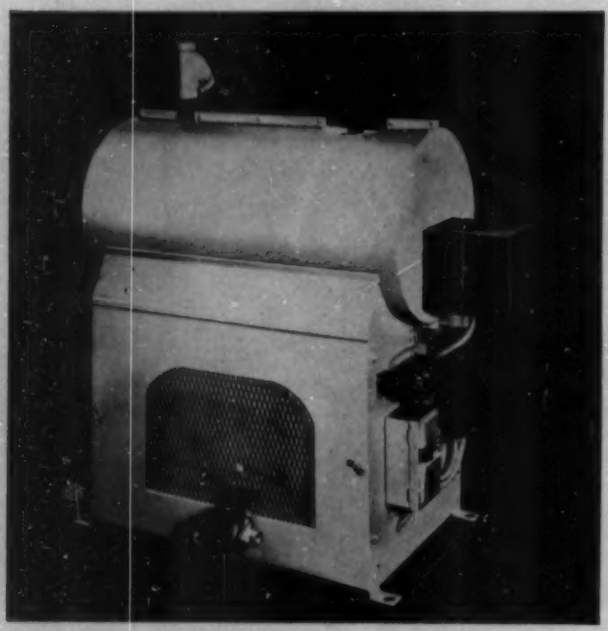


Machinery and Equipment

● PRODUCTION MACHINE CO. HAS BROUGHT OUT A new, high speed, sensitive Reed bench drill. It is claimed to be a production tool for accurate work, an all-purpose machine, capable of unusual speed, and adaptable to a variety of drilling operations, handled with ease and economy. The variable speed drive is completely enclosed, and the only exposed moving part is the chuck and drill itself.

● ECONOMY SHOP-LIFTER, A DEVICE TO HANDLE, transport and hoist dies, fixtures, service presses and like equipment in machine shops and plants handling heavy tools, has been put on the market by Economy Engineering Company.

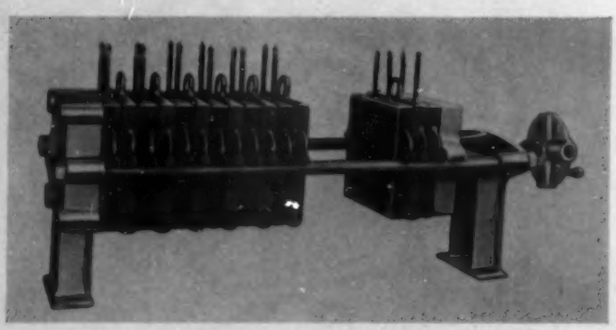
● SMALL-SIZE GEARED-TYPE LIMIT SWITCH HAS been announced by General Electric for application on motor-driven devices where it is necessary to limit the rotation of the motor shaft or some rotating shaft or gear on the driven machine. Its dimensions are $4^{11}/_{16}$ by $3^{1}/_{2}$ by $1^{39}/_{64}$ inches.



● NEW ROYLE HEATING AND CIRCULATING system, pictured above, for heat-transfer media is designed primarily for use with the Royle extruding machines, is said to enable users to arrive at higher jacket temperatures than heretofore without resorting to high pressure. This unit has been developed for use with oil and other heat-transfer media where desired temperature is kept below the boiling point of the material used. The unit may be applied also to types of hydraulic presses, molds and other machines where a positive circulation of thermostatically regulated heat-transfer media is indicated. The standard unit comprises a tank-type reservoir heated by a thermostatically controlled 6,000 watt electric immersion heater, with a special motor-driven hot oil pump, strainer and automatic pressure relief valve. Immersion heater elements of higher capacity up to 11,000 watts available. Specifications: Height, 37 in. Floor space, 19 x 36 in. Tank capacity, 10 to 11 gal.

● COMPACT BENCH-TYPE GRINDER ILLUSTRATED above, for accurate sharpening of single-lip engraving and routing cutters is announced by H. P. Preis Engraving Machine Co. The machine, the Panto Model CG, is said to handle tapered-shank cutters and straight-shank cutters up to $^{1}/_{4}$-in. diameter. The grinding wheel is of the cup type, $2^{1}/_{4}$-in. diameter, and is attached directly to the shaft of a totally enclosed ball-bearing universal motor, operating at 8500 r.p.m. The cutter-holding spindle is mounted in a swivel arm which is graduated for quick setting to any cutting angle or taper desired. Stop notches are provided for grinding three-cornered or four-cornered cutters. While the cutter is rotated with the operator's right hand, the carriage is fed to the grinding wheel by means of a feed-screw actuated with the left hand. Dimensions are $9^{1}/_{2}$ in. long, $4^{1}/_{2}$ in. wide, 6 in. high. Weight is 13 pounds.

● HOGS, CHIPPERS AND SHREDDERS CLAIMED suitable for unusual grinding problems are being manufactured by Mitts & Merril, Incorporated.



● INNOVATION IN FILTRATION EQUIPMENT IS THE new Shriver Filter Press, with filter plates equipped with electric heating elements cast into the plates and terminals projecting above the plates for quick and easy hook-up to electrical feeder wires. This type of filter is claimed to be valuable in experimental and production work on thick, heavy or viscous materials such as resins and plastics which must be heated during filtration to increase the flow rate of the material under any pressure. Unit above has 8 chambers with 4 sq. ft. of filtering area. Larger capacity units are available. *(Please turn to next page)*

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. . . when you pick a molder who has *everything:* a top-notch design department that creates practical and beautiful pieces; a modern tool-room for making the most intricate molds; a complete battery of *both* injection and compression presses; an expert finishing department to meet the most exact specifications.

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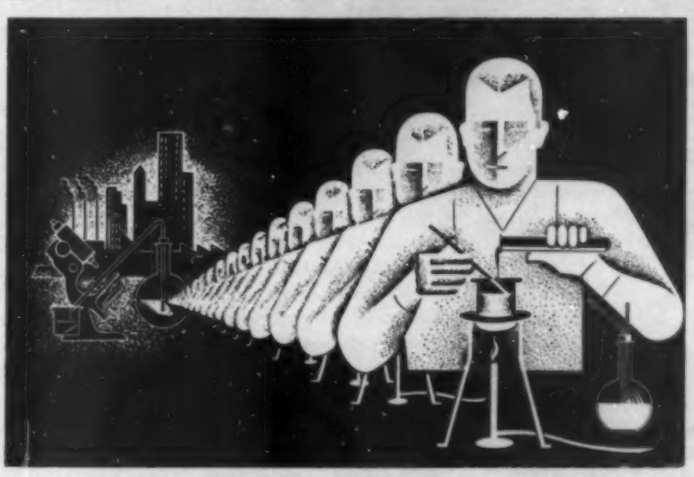

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CONTRIBUTING greatly to the rapid rise of Plastics has been the creation of essential raw materials at prices which permitted their widespread use. Research by du Pont and other enterprising manufacturers made possible dependable uniform chemicals of highest quality thereby relieving a worrisome problem in Plastics manufacture and operation. Research has made available other and newer products at economic prices, and allowed the industry to develop and expand into many new and profitable fields of application for Plastics.

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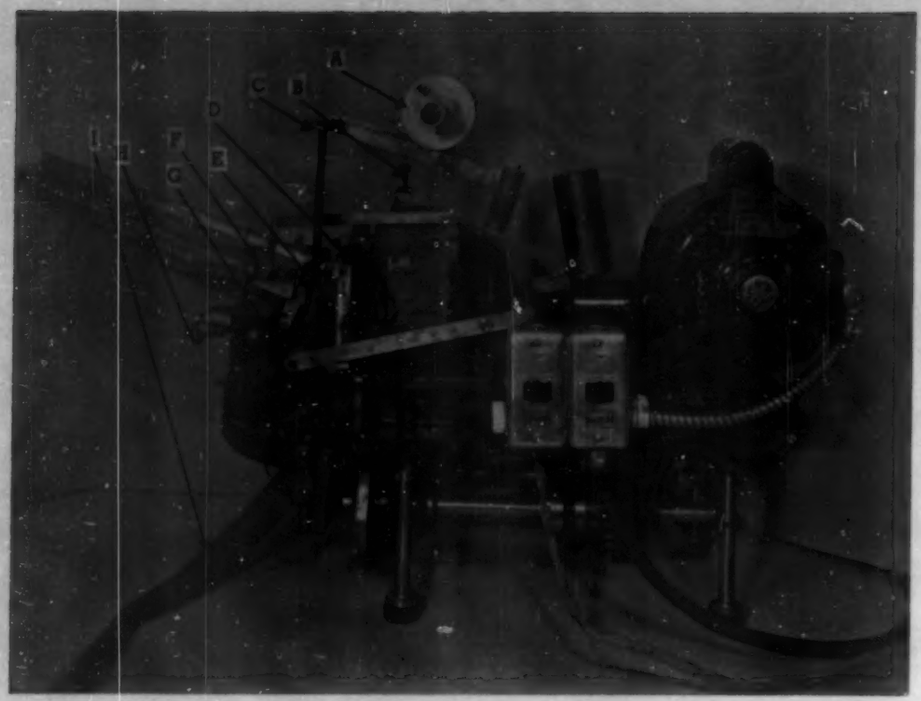


Left—New hot rotary stamping press by Peerless Roll Leaf Co. is used for decorating round plastic surfaces. A—roll leaf holder; B—roll leaf adjusting screw; C—roll leaf breaker bar; D—automatic heat control; E — chase; F — stack feed; G—tension bar; H — pressure adjusting screw; I — leaf showing impressions

● PEERLESS ROLL LEAF CO. HAS DESIGNED A HIGH-speed rotary hot stamping press claimed to stamp hundreds of pen barrels an hour using flat brass dies which can be readily changed. The machine (pictured above) was designed specifically to decorate miniature baseball bat pens and pencils, made by Van Dine Bros. They are sold as souvenirs at ball parks marked with favored players' signatures or used as premiums.

The pen and pencil barrels to be stamped are placed in a hopper from which they are fed automatically into position facing a heated flat brass die over which a web of roll leaf travels. With each press operation, the barrel is rolled across the face of the die, and the design is engraved into the surface of the plastic material, the color being transferred at the same time. The press is set to operate at a speed of 2500 impressions per hour. The roll leaf feeds automatically the exact amount required for each impression. This amount can be adjusted to suit different depths of stamping dies. The leaf is furnished in rolls of the exact widths to correspond to the widths of the dies. The press can be changed over from one imprinting job to another in less than five minutes it is reported. Temperatures are maintained within one degree by a new type of thermostatic heat control. The result is absolute control of uniformity in stamping results. The press is powered by a 1/4 hp. G-E. motor. This stamping method is said to eliminate the cost of molding-in designs, filling-in and wiping-off operations. Other applications which are under consideration at the present time include the stamping of lipstick cases, fountain pen barrels, drum sticks, tool handles and many others. (Various parts of the machine are indicated in the caption above.)

● DESIGNED TO COMBINE 2 OR MORE OPERATIONS in one, a new type multi-processing unit has been developed by Abbé Engineering Co. It is a metal cylindrical container and has the patented Abbe-Lenart agitating-dispersing mechanism consisting of a ribbed mixing disk, a stator ring and a stationary baffled slotted inner cylinder. The rotation of the disk forces the material through the narrow aper ure between it and the stator ring causing rapid milling, disintegration and dispersion of the material to a finely divided and homogeneous state. The material is then impelled upward by the spiral circulating action throughout the entire charge and the material is then reabsorbed into the vortex of the inner cylinder through its slots and over its top. This repeated action, it is claimed, causes a mixing or dispersion of unprecedented intensity which, it is reported, results in considerable time savings in the process.

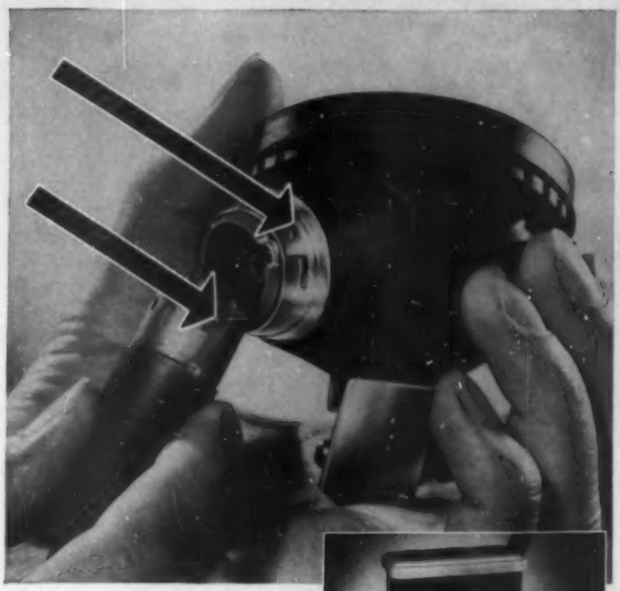
The combination milling and dispersing operation may also be combined with one or more other operations and the equipment used as an autoclave, still, carbonator, evaporator, concentration or dryer with accurate control of temperature and vacuum or pressure, it is reported.

● SYNTHANE CORP. ANNOUNCES THE INTRODUCtion of new cam blanks for Brown & Sharpe automatic screw machines, claimed to make it possible to turn out a complete set of cams quickly. Only a small wood-cutting bandsaw, a disk sander and filer are required, but it is recommended by the company that an experienced worker do the cutting and finishing. Cam blanks are furnished in sets of 3 for sizes 00, 0 and 2 B & S machines. All blanks have center hole bored, pin hole drilled and have radial lines for ease of layout. Cam blanks are reported to be useful for all but the heaviest feeds, and ideal for short runs.

● COMPLETE LINE OF REED MICROMETERS IS now being distributed by George Scherr Co., Inc. These micrometers include four distinct models in the 1 in. size and others from 2 in. to 6 in., and also seven models of inside micrometers with various measuring capacities and two types of micrometer depth gages.

● EXPLOSIMETER, NEW COMBUSTIBLE GAS INDIcator, made by Mine Safety Appliances Co., is stated to be compact, strongly built and light in weight, with a simplified electrical circuit featuring a single filament and single control knob, and can be operated with one hand. Immediate response to combustible gas concentrations is provided by the instrument's easy-reading meter, with positive reading on second squeeze of bulb (5 ft. sampling line). The flow system is cast integral with case, without tubing or connections to leak, and a built-in filter chamber is provided to trap dust and moisture. This filter chamber will also accommodate a charcoal cartridge for proper differentiation between illuminating gas and condensible, combustible vapors such as gasoline.

IT'S SMALL BUT SO IMPORTANT



THE Lucite bushing on the electric miner's cap lamp made by Portable Lamp and Equipment Co. of Pittsburgh, Pa. is small, but the part it plays in improving ease of operation is big.

Originally the headpiece of the lamp was made without this bushing and considerable difficulty was encountered in following the complicated T slot made necessary by mine safety laws.

Now with the transparent bushing, the cable and the lamp can be joined in a jiffy. The entire T slot and the connecting pin are in full view at all times. A source of annoyance was eliminated once and for all.

Auburn has been the means of improving many a product. In some cases our 60 years' experience enables us to give specialized help in plastic design. In other cases our ability to mold to exacting needs permits an otherwise impossible improvement to be made. When you specify Auburn, you buy more than just plastics—you buy 60 years of knowing how—but it costs you no more.

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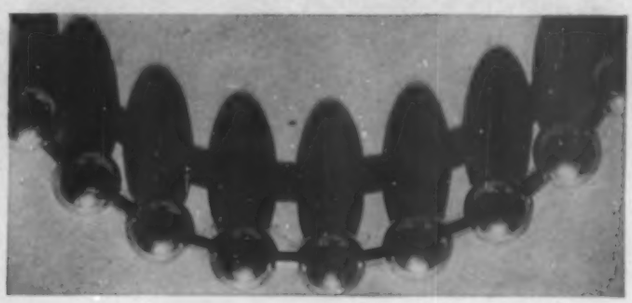
INGENUITY



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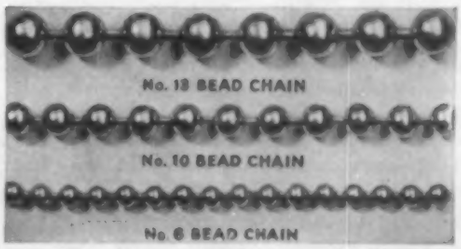
We may help with ingenious adaptations of non-kinkable BEAD CHAIN* to your products but we can hardly originate them unless we know your problems. We know BEAD CHAIN,* how it can be finished, how attached, and if chain or other fastening is desirable with your products, then with your ingenuity and ours a practical improvement may be devised. But first we must hear from you.



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In The Limelight

● BAKELITE CORP., UNIT OF UNION CARBIDE AND Carbon Corp., has announced that it will shortly start construction on a new building at the company's plant in Bound Brook, N. J., to be used for the manufacture of Bakelite urea molding materials. These have been manufactured since 1937 in a pilot plant at Bound Brook. The structure will be 80 ft. wide, 260 ft. long and 2½ stories high. Francisco and Jacobus, New York City, are the architects. Construction will be completed in the Spring of 1941, it is reported.

● ANNOUNCEMENT HAS BEEN MADE OF THE RESIGnation of Dr. Leo Nast as vice-president, Charles E. Slaughter as sales manager, and Henry Frey as superintendent of Universal Plastics Corp. New appointments include E. Sessler as general manager, N. C. Hyman as New York office representative, and Mr. Lockwood formerly of Gorham Co. as superintendent in charge of the molding division. Bernard Schiller, formerly of Gemloid Corp. is also connected with the company.

● DAVE SWEDLOW CORP. HAS CHANGED ITS CORporate name to Swedlow Aeroplastics Corp. Mr. Swedlow is still president of the Corp. whose address remains 1505 Gardena Ave., Glendale, California.

● IT IS REPORTED THAT AN ENTIRELY NEW PLANT designed for the manufacture of H-P-M Fastraverse hydraulic presses is being built by the Hydraulic Press Mfg. Co. at Mount Gilead, Ohio; architect and builder is the Austin Co. of Cleveland. The building (pictured below) is to be 400 ft. long arranged in three parallel bays of increasing widths and heights. Designed for straight-line production of heavy equipment, castings and other raw materials will enter the plant at one end, proceeding progressively through the various finishing and machining operations to the assembly floor. Entrances for railroad cars and trucks will be provided at both the receiving and shipping ends. Each of the two production bays will be equipped with complete lines of modern machine tools, traveling cranes and other facilities of extra heavy and medium capacities respectively.

Operations are expected to be underway this month. The present plant is to be entirely re-arranged for the manufacture of the Company's standard lines of hydraulic power transmission equipment and plastic molding machinery.

In line with its expansion program, the company has recently equipped a complete experimental laboratory for plastics. This development as well as the completed new plant will be pictured and described more fully in these columns as soon as more details of progress are available, and construction completed.

● FALL SESSION OF THE SOCIETY OF THE PLASTICS Industry is scheduled for Sunday, Monday, and Tuesday, Oct. 13, 14 and 15, at the Buckwood Inn, Shawnee-on-Delaware, Pa. The entire Inn and Country Club grounds will be taken over for the gathering. The clan will assemble Sunday afternoon and evening for registration, badge distribution and golf. Sunday evening will be a get-acquainted time. Monday morning at 10.00 a.m. there will be a Business Meeting of short duration, followed by a Technical Session based on the Information Please program. All those attending are requested to send in questions relating to the industry. After lunch a *foozle* golf tournament will be held. Each golfer is allotted a number of strokes, amounting to half his handicap, which he can take over without penalty during the eighteen hole round. His final score made in this way will be corrected by half his handicap to arrive at his net on which prizes are awarded. There will be one prize to each four golfers. A separate sweepstakes will also be operated. For non-golfers incidental entertainment and music will be available from the middle of the afternoon on. Dinner will be served at 7.00 p.m., at which the golfing prizes will be distributed. Door prizes will be drawn for every fourth man among the non-golfers. Entertainment follows. Tuesday a golf exhibition will be put on.

Every member should by now have received their reservation blanks and should have returned them to the Chairman of the Entertainment Committee, Geo. K. Scribner, Boonton, N. J. If not, you are requested to do so as soon as possible. And remember, send in your questions!

● SYNTHANE CORP., MANUFACTURER OF PHENOLIC laminated products, has just completed a new press room addition to their Oaks, Pa., Plant. The first piece of equipment placed in operation was a new laminating press for handling special lengths up to 100 inches, it is reported.

● RATHKAMP & CO. REPORTS THE REMOVAL OF its offices to 250 W. 57th St., New York City.

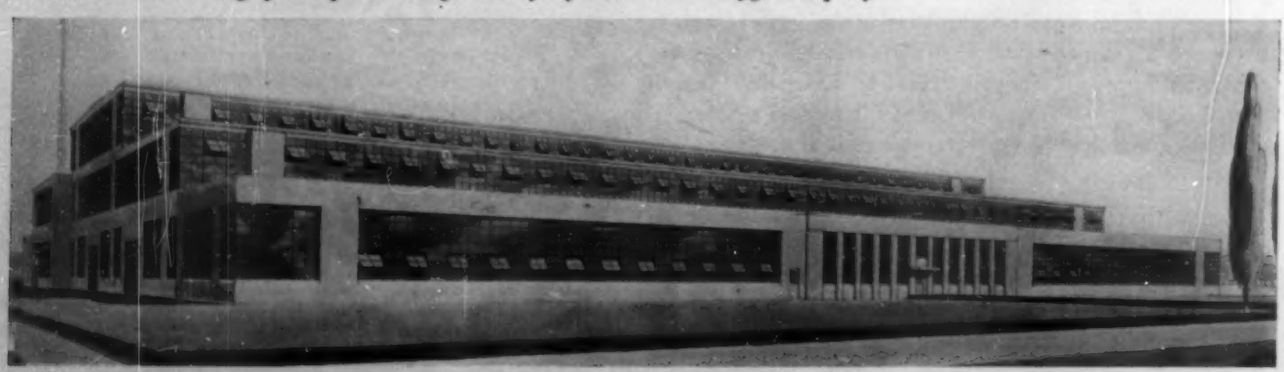
● DIVISION OF CONTROL OF THE DEPARTMENT OF State has issued the following statement concerning the operation of the Export Control Act in defining optically clear plastics:

"Pending further instructions the term 'plastics, optically clear' is to be interpreted to include only methyl methacrylate plastics in the form of colorless sheets of a thickness greater than sixty one-thousandths of an inch (0.060") and does not include cellulose acetate, vinylite and other plastics. Nitrocellulose in plastic form will, nevertheless, be subject to license."

This definition clarifies the restriction imposed by the President, acting under the National Defense Act of 1940, when by proclamation, he acted to restrain the free export of several materials including by broad designation certain transparent types of plastics.

(Please turn to next page)

Architectural drawing of new plant being built by Hydraulic Press Mfg. Company



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1. Maintains constant pressure for an indefinite period
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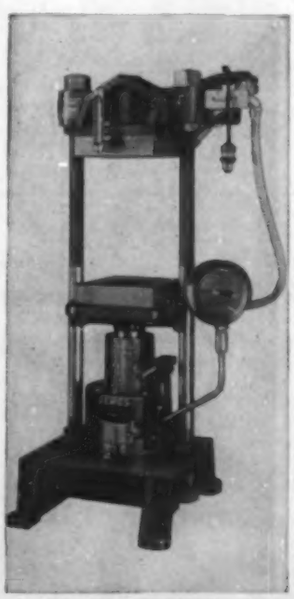
One special feature of this press is that it maintains constant pressure against a dead head for an indefinite time. This is possible because of a new valve and a specially designed packing.

Built according to high standards of precision, accuracy and strength to meet the rigid requirements of a wide variety of laboratories. Results accurate when translated into terms of production equipment. Write for details.



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does big things in molding plastics —on time

General Industries has done and is doing many notable things in producing molded plastic parts. Units of unusually large dimensions are well within the range of our mammoth presses; and requisitions for hundreds of thousands of parts monthly are handled with ease by our large capacity plant.

With our modern equipment we can give positive assurance that deliveries will be made as specified and that quality and finish will be maintained at high standards. All operations are under one roof, under one direction, from making the molds to providing metal inserts where required. Let us bid on your next job.

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● W. H. MILTON, JR. (ABOVE) WHO HAS BEEN SALES manager for the General Electric plastics department at Pittsfield, Mass., for the past two years, has been appointed assistant manager, responsible to G. H. Shill, manager, for all phases of the department's activities. Mr. Milton has been associated with General Electric since 1920, when he became a member of the company's student engineering course at Schenectady. After serving in various departments as mining specialist and in the chemical and rayon fields, he became manager of sales of the G-E plastics department in 1938.

● MANUFACTURERS CHEMICAL CORP. ANNOUNCES A reprocessing service for reworking acetate gate scrap into uniform colors or black. It is reported that the reworked material has a uniform flow and has proved very satisfactory.

● THROUGH THE MERGER OF ARMOUR INSTITUTE of Technology and Lewis Institute, the Illinois Institute of Technology, Chicago, has been formed with H. T. Heald as president. J. D. Cunningham was elected chairman of the Board of Trustees, and Alex D. Bailey, vice-chairman.

● BALDWIN LABORATORIES, INC., SAGERTOWN, PA., reports a reorganization with Lucius W. Robinson, assuming the presidency, Mr. Baldwin, becoming vice president in charge of the Chemical Division, and Wm. S. Perry, vice president and general manager of the Plastic & Die Casting Division. The latter division is moving to Franklin, Pa., and will operate as a subdivision under the name, Franklin Plastic & Die Casting Company, Mr. Perry informs us.

● SPECIAL CHEMICALS CORP., 30 IRVING PLACE, New York, announces its development of "Metalon Process" for metalizing plastics. The manufacturer claims that this new technique, economical and speedy, results in a metallic precipitation furnishing an excellent conducting surface. A smooth initial coat without use of lacquer or bronzing is featured, enabling a smooth finish on the buildup.

● POLYTECHNIC INSTITUTE, BROOKLYN, N. Y., REports the appointment of Doctor H. Mark of Hawkesbury, of Canada as Professor of Organic Chemistry. Professor Mark, previously of the University of Vienna, will direct research in the field of high molecular weight compounds.

● A VIOLENT EXPLOSION IN ONE OF THE VINYL manufacturing buildings of the Shawinigan Resins Corp., subsidiary of Monsanto Chemical Co., Indian Orchard, Mass., on August 19th caused considerable damage and injured several persons. John C. Brooks, general manager, reports that repairs are underway and the plant will be operating under almost normal conditions in about a week or ten days.

● TWO NORMAL PRIMARY ALCOHOLS, NORMAL octanol and normal decanol, announced by the Fine Chemicals Division of E. I. du Pont de Nemours & Company, have been available for the first time in commercial quantities. It is reported that properties of the alcohols indicate they may be used in the plastics industry as a lubricant in molding plastics. The two alcohols are said to be good anti-foaming agents, have very low solubility in water, but abate foam effectively within the solubility limits, 0.01 to 0.05 per cent, according to the company. Normal decanol has a bland odor. They may be used as mixed solvents, and provide a means of introducing octyl and decyl groups for chemical manufacture, according to the report.

● **FALL MEETING** S. P. I.

Buckwood Inn, Shawnee-on-Delaware, Pa.

OCTOBER 13-14-15

See Page 82 for Details

ENTERTAINMENT
TECHNICAL SESSION

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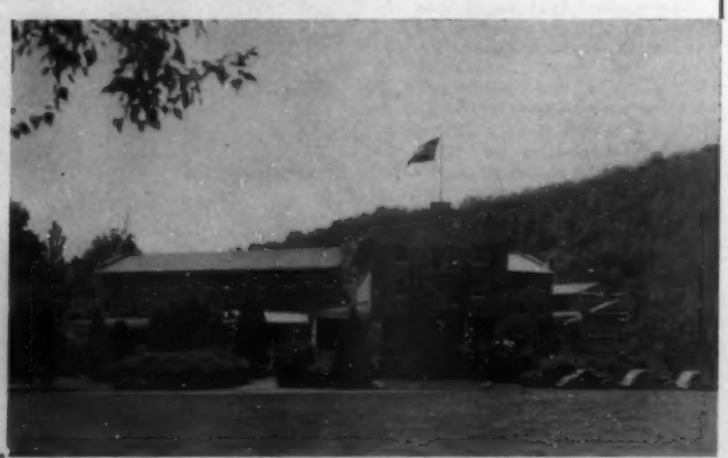
S. P. I. S. P. I.



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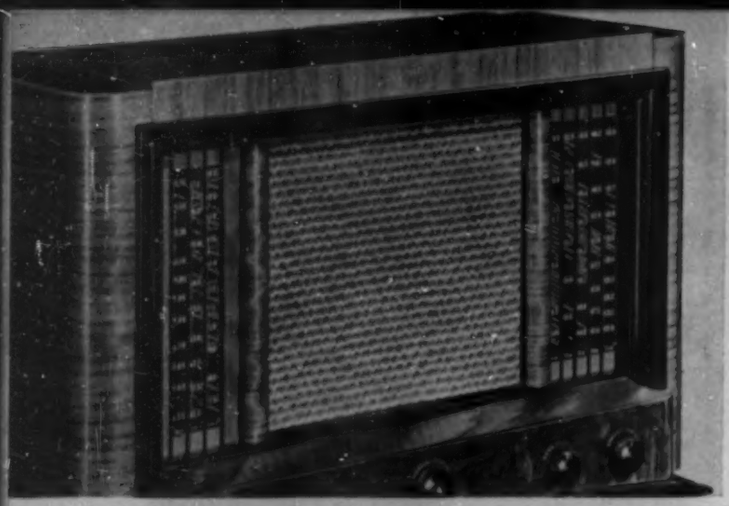

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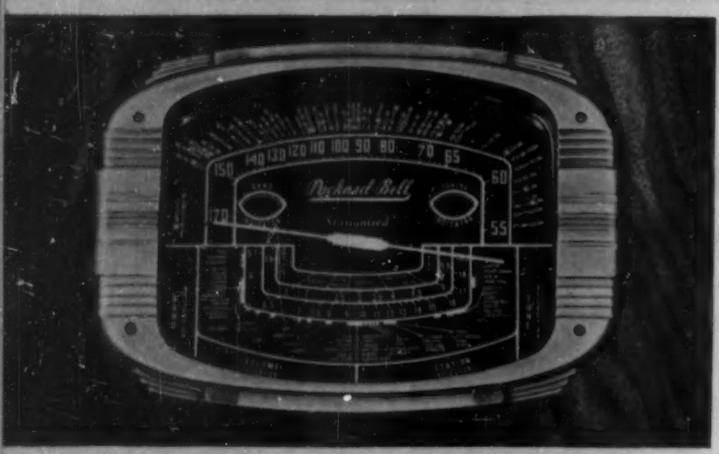

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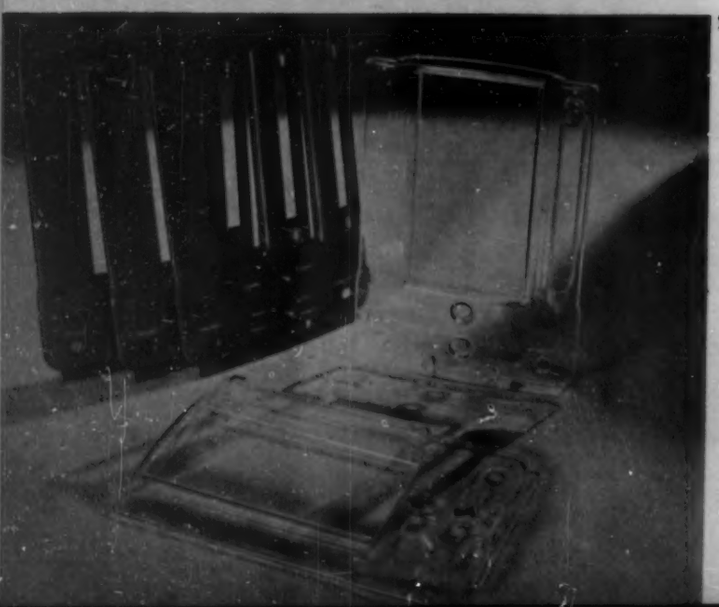

21

On the air

(*Continued from page 37*) inconspicuous knob located at the lower right corner of the face of the cabinet. One of the General Electric Co.'s most recent table models has a urea cabinet which is of rectilinear design (see Fig. 16). Straight walls make the design very effective.

An outstanding cabinet is represented by RCA's model 5Q5 (Fig. 17). The design is the essence of simplicity—except for a plain decorative motif which runs around the base, the cabinet is impressively plain, without other decorative trim through the long sweeping side walls. The dial is placed for ready visibility.

Plastics in other than molded, laminated and cast forms are also widely used in radios. In many cases both the windows of the attractive dials and the dials themselves, which are printed, are made from various plastic materials. These applications are splendidly illustrated in the dial arrangement of the current Packard-Bell radio (Fig. 20).

A Chicago molder has recently engineered and molded a thermosetting cabinet wherein the dial face is an integral part of the construction. At four points occurring on each side of the rectangular dial opening a recessed bevel is molded into the housing. This enables a piece of formed transparent plastic sheet stock to be snapped in—once in place it is securely held in position. This method of constructing should appeal to the engineers of the assembly line.

Philco in their photo-electric radio-phonograph have used as a housing for the delicate pick-up mechanism an injection molded cellulose acetate part (Fig. 19). This, they had determined after investigation in their sound laboratories, had acoustical properties which fit the application satisfactorily. Because of the thickness of plastic employed, the color selected, the unusual use of light to serve a two-fold functional purpose, the material is working well. The device enables the operator to see the "pick up" when playing the instrument and, at the same time, it protects the fragile parts. A small tell-tale button in addition is an integral part of the pick-up housing. This is molded from material of a contrasting color.

In an original manner, and incidentally for the first time in the industry, Philco has taken advantage of

18—Continuous length extruded Tenite II profile rod is used for the first time in radios by Philco. Strands cut to length of the screen separate vertical wave length indicators. 19—Injection molded cellulose acetate houses the delicate photo-electric pick-up mechanism on the unique Philco radio-phonograph. Small button is molded in contrasting color. 20—Packard-Bell radio has a printed dial and transparent dial cover of Plastacele. 21—Capehart radio escutcheons, large injection molded Crystalite pieces, measure more than 56 sq. in. in projected area. Painted on the reverse side, clarity of the acrylic gives a three-dimensional effect

THE LIST OF USERS OF THE CARVER LABORATORY PRESS

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The Carver Laboratory Press has become the standard press for plastics research in thousands of firms and hundreds of university and government laboratories —all over the world! The reasons are simple: it is designed for research. It is lightweight: 125 lbs. Yet it gives pressure up to 10 tons—and repeatedly, without faltering. It has been in actual use for upwards of 12 years without mechanical failure—and still going strong!

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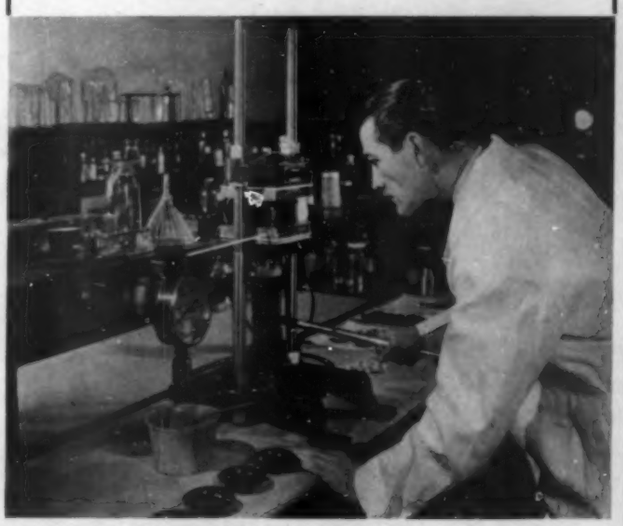
Also comes equipped for general research, with interchangeable accessories for more than 60 general applications, subdivided into hundreds of specific uses. Just plug into a light socket and go to work!



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Courtesy CELLULOID CORPORATION

15 YEARS

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now shares the work at the plant of "the Granddaddy of them all" in plastics — the CELLULOID CORPORATION.

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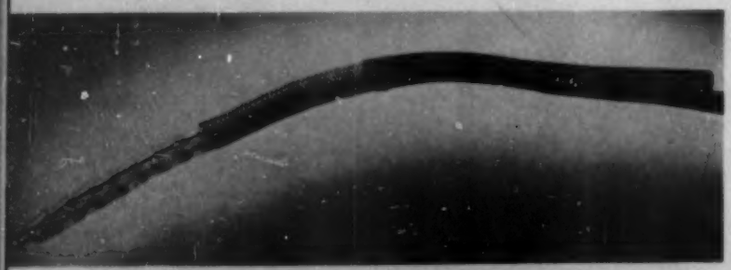
WINCHENDON, MASS.

continuous length extruded plastic profile rod. In their wooden table model 778T the vertical parallel wave length indicators are separated by pieces of this type of strip, which are cut to length (Fig. 18). While these serve to hold the several sections in place they also act as a screen and prevent light from migrating, confining it to the area where it is intended to be directed.

With all the numerous commercial advances that are being made, the wireless operator has been neither forgotten nor overlooked. The McElroy Oscillatone, which has as a companion device the "Streamkey," provides equipment to serve these experts of the future (Fig. 24). These are working trainers for incipient operators. By using an injection molded key base with a plastic housing on the sound device, a thoroughly satisfactory result is achieved.



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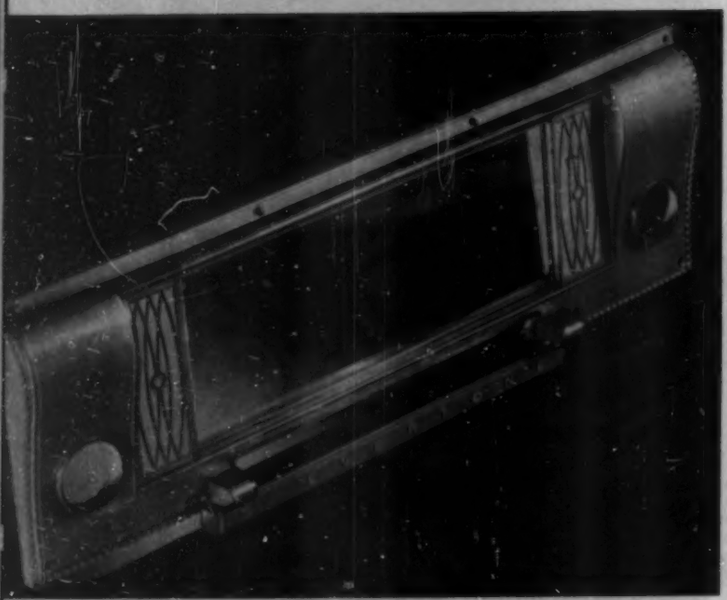

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Injection molded materials have been popularly employed for functional and decorative purposes on console radios. A Silvertone, with a clear cellulose acetate-butyrate escutcheon lacquered on the reverse side, achieves an amazing effect. The part is a noteworthy injection molding achievement (Fig. 23). The escutcheon, by having the letter show through to the surface colored to contrast with the general background, serves as a name plate as well.

Capehart in their latest models is using dials constructed in this manner also. (See Fig. 21.) They are achieving excellent results with crystal-clear acrylic resin injection molded into a large piece 56 in. square which fits compactly behind the escutcheon plate. The clear piece is painted on the back for a three-dimensional effect and is claimed to be proof against warpage and shrinkage.

Coaxial cables which are used in television transmission, are also used in standard radio transmission, have adapted injection molded polystyrene in an essential part of their equipment. One of the outstanding coaxial cable installations is that which has been installed between Philadelphia and New York. Several manufacturers of coaxial cables are using injection molded polystyrene beads as a functional part of cables of this class. The beads are (strung) on the conductor. Around them then is placed continuous length coaxial shield. By adapting this method of assembling, the conduit is allowed to flex and the desirable dialectric properties of polystyrene add to the efficiency of the assembled conductor (Fig. 22).

What of plastics in radios of tomorrow? Their destinies appear to be inextricably interwoven. What the radios of tomorrow will demand of plastics remains to be seen. What will originate in plastics that will contribute toward advancing the science of sound transmission and reception is wrapped up in the progressive developments of the industries' laboratories. As in the past plastics will fulfill the radio industries' meticulous demands for specification materials which must meet varied and varying conditions.

And any look at the future of sound transmission requires careful consideration of the unfolding television horizons. Here too plastics are destined to play an important role.

22—Coaxial cables, of considerable importance in relaying television programs, are injection molded of Monsanto polystyrene in the forms of beads which provide support as well as insulation. 23—See-Deep radio bezel on the Silvertone is molded of transparent Tenite II and painted on the back. 24—McElroy Oscillatone (left), housed in Monsanto cellulose acetate reproduces the dots and dashes of radio telegraph, by sounding off through slots molded in the front of the cabinet. Companion piece (right) is the Streamkey, radio sending instrument. Base of this unit, also injection molded, provides needed electrical insulation and helps to reduce the number of parts required in assembly

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DISSTON PLASTALLOY gives you the greatest core strength and resistance to sinking consistent with ease of hobbing.

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for the Plastics Industry

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for cutting down

LEAROK No. 746
for cutting and coloring

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for color buffing

These three different grades of Learok are along lines entirely new to the art of polishing and buffing, yet logical for the plastic industry.

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THE LEA MFG. CO.

WATERBURY, CONN.

Specialists in the Production of Clean-Working Buffing and Polishing Compounds

History of plastics

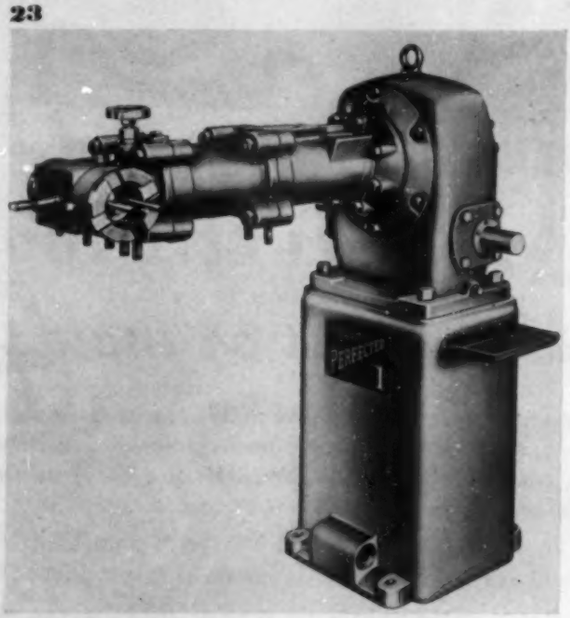
(*Continued from page 67*) take place, in some cases practically to the final reaction stages, transferring this material in a rapidly flowing condition to a closed mold, filling the cavity without violent surges at high pressure, applying pressure to the plastic in the mold cavity while heating to set the formed plastic material, and finally ejecting the finished article from the mold cavity and the excess material from the pressure chamber in readiness for another molding cycle.

Transfer molding is of particular advantage in that erosion of dies, breakage of small pins, and displacement of and damage to inserts, so common to compression molding, can be prevented. Fragile inserts, such as glass and thin metal parts, can be used successfully. The high-impact-strength type of molding compound with its coarse fibrous filler can be molded with very little flash and in much thinner sections than by compression molding. Higher and more uniform density is produced and separation of resin from the filler is minimized by transfer molding. Although the necessity of allowing for cure of the resin in the mold imposes a limitation on the speed possible with this method, the total time that the material is in the mold is considerably less than in compression molding. Since the process has been employed particularly for moldings that have required the manual setting of inserts or cores, full-automatic operation of equipment has not been especially emphasized. However, C. D. Shaw is reported to have perfected an injection press for handling phenolic and urea resins in a continuous production cycle of 11 seconds. The powder is continually warmed from the time it is dropped through the hopper into the heating cylinder until it is in the proper condition of plasticity and temperature to flow readily into the mold and then harden in a few seconds. Commercialization of this press in 1940 will mean the availability of fully automatic injection equipment for handling the comparatively inexpensive thermosetting materials, and a potential shift of the favorable price factor for small pieces in relatively limited quantities back to the thermosetting materials, which lost it a few years ago to the injection molded thermoplastics.

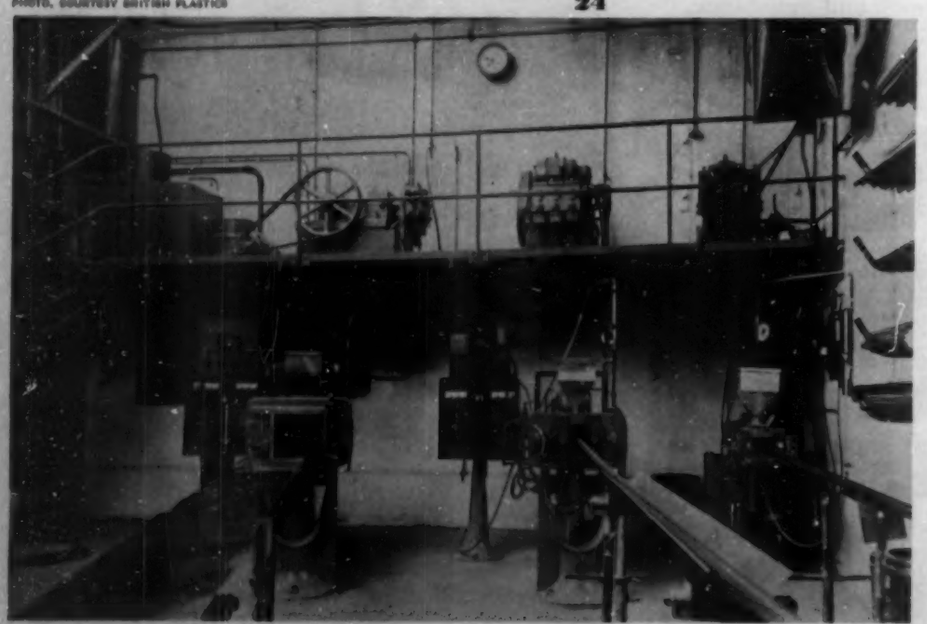
Extrusion molding

The manufacture of rods and tubes from thermoplastic materials by hydraulic extruding machines dates back to the early days of rubber and pyroxylin fabrication and has since been used for casein, cellulose acetate, vinyl and styrene resins, and similar plastics. The material is fed into a heating cylinder, ordinarily of the steam-jacketed type, and is extruded through nozzles to produce rod and tubing of various shapes and sizes. More recently this process has been adapted

23



PHOTO, COURTESY BRITISH PLASTICS **24**



23—*Screw-type plastic extrusion machine for thermoplastics made by John Royle & Sons.*
24—*View of a foreign molding shop: left—press for sheets; right—presses for extruding tubing and solid section thermosetting materials*

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PUNCHED FLAT SHAPES IN COLOR
Let us make your flat shapes of Ameroid, with low tool cost . . . and add the beauty of color at no extra expense. Submit your sketches or samples for quotations.
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That's why you can find no single formula for the designing of molded plastics. That's why

STOKES MOLDED PLASTICS

are designed and engineered with an eye to all factors. First, the adaptability of your product to molding processes . . . next the best process and materials . . . then its merchandising possibilities . . . cost of production and your potential profit, to name a few. We'd like to analyze your particular problem. The benefits of our 43 years molding experience is at your disposal.

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MOLDERS OF ALL PLASTICS—Including Hard Rubber—SINCE 1897

in Germany to the production of extruded moldings of any desired profile from the thermosetting phenol-formaldehyde and urea-formaldehyde resins. In contrast to standard compression and injection molds, the one used in extrusion molding is open on two opposite sides to provide an inlet and an outlet. Essentially it is a nozzle long enough to permit curing of the resin before it emerges. The pressure necessary for the molding action is obtained by a slight conical taper in the mold channel plus the retarding effect of the hardened material near the outlet of the mold. The temperature of the solid powder fed into the machine is gradually increased until it reaches a plastic state; at this stage it is fed into the profile mold wherein it very quickly hardens. The speed of discharge of this hardened material is controlled to produce the requisite pressure in the plastic mass behind it.

Extrusion molding of thermosetting plastics has not yet been undertaken in this country, but it probably will be. If its use here is marked with the same strides of improvement that have accompanied the transplanting of other European plastic developments to the United States, it should lead to some very outstanding accomplishments. For not only rods and tubes can be produced by this method, but also flat sheets and boards of various shapes. Boards 10 inches wide, 1/8 inch thick, and in continuous lengths have already been extrusion-molded in Germany from phenolic plastics. The suggested uses for profile moldings include rails, handles, wainscoting, and wall paneling in the building industry, hand rails and running boards in the automobile industry, piping and rollers for the chemical industry, and lamp pedestals and pendants in the lighting industry.

Direct hydraulic molding

All of the methods of molding described up to this point have involved presses for applying either mechanical or hydraulic pressure and steel molds in which to shape the plastic. Both of these are expensive items and have tended to limit molding to the production of relatively small objects in large volume. Engineers in aircraft research laboratories in both Europe and the United States have been experimenting for several years on methods of molding which would eliminate these restrictions on the size of molded parts. Of course, one can take standard sheets of resin-impregnated laminated plastics and build airplane structures by methods similar to those which have been used for many years with sheet metal and plywood. But the desire of the aircraft engineer is to mold complete fuselages and wings as individual units and thus reduce to a minimum the labor costs and time involved in cutting, shaping, drilling, and riveting the many hundreds of parts now used in the construction of airplanes.

(*Please turn to next page*)

SUMMARY OF COMMERCIAL DEVELOPMENT OF PLASTICS IN THE UNITED STATES

1870	Cellulose Nitrate	Sheets, Rods, Tubes
1895	Shellac Composition	Molding Compound
1909	Bitumen Composition	Cold-Molding Compound
1910	Phenol-Formaldehyde Resin	Molding Compound
1912	Phenol-Formaldehyde Resin	Laminates
1919	Casein	Sheets, Rods, Tubes
1919	Coumarone-Indene Resin	Protective Coatings, Adhesives
1922	Phenol-Furfural Resin	Molding and Laminating Compounds
1926	Alkyd Resins	Protective Coatings
1927	Cellulose Acetate	Sheets, Rods, Tubes
1928	Phenol-Formaldehyde Resin	Cast Sheets, Rods, Tubes
1928	Urea-Formaldehyde Resin	Cast Transparent Sheets
1928	Vinyl Ester Resins	Protective Coatings
1929	Urea-Formaldehyde Resin	Molding Compound
1929	Cellulose Acetate	Molding Compound
1930	Styrene Resin	Opaque Molding Compound
1931	Acrylic Resins	Protective Coatings
1932	Cellulose Acetate Butyrate	Protective Coatings
1935	Ethylcellulose	Protective Coatings
1936	Methyl Methacrylate Resin	Cast Sheets
1937	Vinyl Butyral Resin	Binder for Safety Glass
1937	Methyl Methacrylate Resin	Molding Compound
1937	Lignin Plastic	Sheets
1937	Styrene Resin	Transparent Molding Compound
1937	Cellulose Acetate Propionate	Protective Coatings
1938	Cellulose Acetate Butyrate	Molding Compound
1939	Vinylidene Chloride Resin	Coatings and Extruded Tubing
1939	Methylcellulose	Adhesives and Coatings

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R. D. WOOD PRESSES . . . are known throughout industry for their dependability and high performance. Consult with WOOD engineers on your press requirements.

Illustrated above is a 3180 Ton Hydraulic Precision Belt Press. The 24 Meehanite press rams as well as stretcher rams are chromium plated and polished to prolong packing life. Steam plates, size 66" x 30'-0", have polished working surfaces. Clamp and belt stretcher with 42" stroke have 60 tons capacity.

ESTABLISHED 1803

R. D. Wood Co.

PHILADELPHIA, PA.

HYDRAULIC PRESSES AND VALVES FOR EVERY PURPOSE

Synthetic resins by themselves or in the form of ordinary molding compound containing woodflour filler lack the necessary strength and stiffness to be used for making aircraft structural members. Admixture of the resin with wood pulp or ground up fabric gives a molding material of much better impact strength, but still insufficient for aircraft purposes. But by taking the wood filler, not as ground-up flour, but as veneers in which the oriented cellulose fibers contribute strength and stiffness, and utilizing the "plastic" properties of the synthetic resins, that is to say, their ability to be shaped by the application of heat and pressure, and to retain the desired form when the shaping influences are removed, some progress has been made toward the development of a technique of molding which offers promise of eliminating the major obstacles of limitations on press sizes and capacities and mold expense.

This method of molding involves the application of hydrostatic pressure to resin-impregnated fibrous sheets wrapped around a core of wood, concrete, or other suitable material, and inclosed in an air-tight bag or protective wrapping. An oil bath similar to the large ones now employed for bonding glass to plastic in the manufacture of laminated glass could be used for the application of heat and pressure to this wrapped core mold. In actual experiments wing sections have been molded in this fashion by placing them in large rubber vulcanizers and using steam as the heating and pressing agent. Although interest in this new technique for molding has centered primarily in the aircraft field, its significance transcends this particular industry, for it must be kept in mind that any material which is successfully developed for molding airplane wings and fuselages will also have other applications of larger volume, such as automobile fenders and bodies, house construction units, furniture, small boat construction, and railway freight cars.

From collars and cuffs to airplanes and furniture is a big jump for only seventy years' growth of an industry. When it is realized that the major portion of this metamorphosis took place during the streamlining thirties, the present position of plastics development is even more astounding. What the forties will bring is still to be revealed, but certainly the recent emphasis on fully automatic molding with its attendant improvement in the quality of moldings and the intensive search for plastics suitable for structural parts will be important factors in guiding the progress of plastics during the new decade that lies ahead.

Synthetic resin emulsions

(*Continued from page 63*) emulsions with inerts and extenders, without consideration for the binding capacity of the resinous vehicle, result in failures.

In the pigmented paste or paint stage, the pigment is suspended and wet by the aqueous phase, while the resin exists as discrete particles, less than one micron in diameter, also suspended in the aqueous phase. Attempts to grind pigment into the resin are therefore useless and may be actually harmful. It suffices to agitate the emulsion and pigment in a good mixer, or to pass the paste rapidly through a stone or roller mill adjusted to a coarse setting. On spreading this paint into a film, water evaporates, the emulsion *breaks*, and the pigment becomes bound by the resin particles which have coalesced and formed a continuous, homogeneous, protective film.

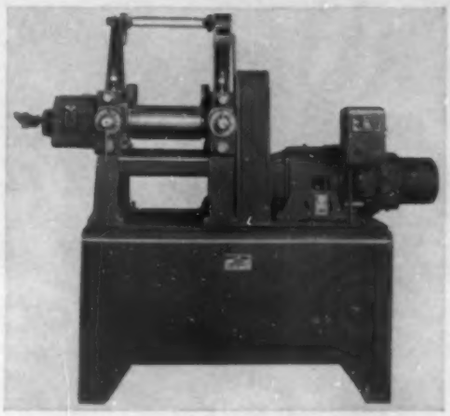
Alkyd emulsions are capable of being mixed with water paints based on casein or glue. In such mixtures, the properties and behavior of the casein or glue of the water paint predominate, unless the ratio of alkyd emulsion is very high. In other words, there may be good reason for using an alkyd emulsion to fortify and improve the film characteristics of a high-grade, well-formulated casein- or glue-base paint, but the mere addition of an alkyd cannot correct the deficiencies of a water paint which has poor keeping qualities, poor water-resistance, etc. Likewise, it is dangerous practice to add casein or glue as such to alkyd emulsions for the purpose of extending, adding *body*, etc. The waterproofness and durability are adversely affected, and usually the stability also suffers.

Besides the very obvious advantage of being dilutable with water, emulsion paints with their synthetic resin binder possess certain advantages in applications characteristic of emulsions. Chief of these is coverage on porous surfaces, where it is desired to avoid excessive penetration and consequent waste of paint. For this reason, emulsion paints are peculiarly suited to give economical water-resistant coatings on concrete, stucco, plaster, brick, and masonry of all kinds; also on fiber board, composition board, asphalt, etc. Also, being aqueous emulsions, it is possible to apply them to damp surfaces and obtain excellent adherence and sealing. These advantages coupled with the capacity of excellent color retention even in the lightest shades and durability comparable to good oil paints indicate the versatility and features of these new paint vehicles.

Refrigeration efficiency

(*Continued from page 45*) or screws into the body of the door to hold the glazing strips in place and the solution was found by inserting rubber plugs in the body of the door in the proper locations. A molded spring-latch at both top corners of the frame prevents too rapid sliding of the door which might bang it against the sides and break the glass. The finished unglazed door was found to be approximately 10 or 15 percent lighter in weight than other doors now being used. This saving in weight was a result of the cored-out construction of the door frames (Fig. 2). Although the specific gravity of the plastic material used in the door frames is equal to, or slightly greater than materials formerly used for this application, the smaller amount of material necessary made possible the resultant saving in weight. The frames are about 2 in. wide and $1^{5}/_{8}$ in. deep. (*Please turn to next page*)

A LABORATORY MILL
Designed For The PLASTIC INDUSTRY



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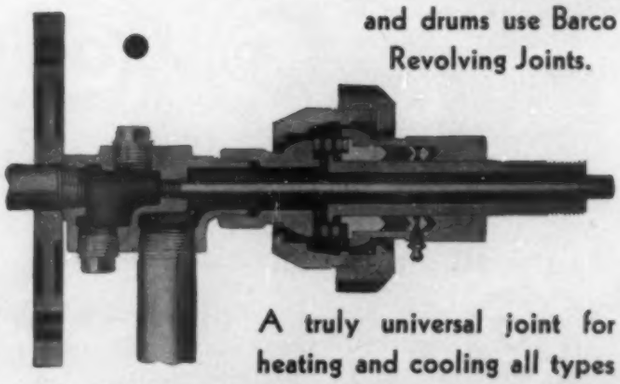

A truly universal joint for heating and cooling all types of rotating rolls. Eliminates packing troubles due to strains in ordinary stuffing boxes.

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Because Claremont flocks have the longest fibers—insuring extra tensile strength in the finished plastic.

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CLAREMONT WASTE MFG. CO.
CLAREMONT NEW HAMPSHIRE
The Country's Leading Makers of Cotton Flocks

The rails upon which the sliding doors travel did not present as many problems as the door frames. The main consideration was to use a material that would not warp, and the phenolic plastic used took care of this requirement. The molded cotton tracks and top guides are quite long. Each rail has a double track so that while one door is sliding, the door in motion will run back of the adjoining door. Two raised portions running the entire length serve as guides on the lower rail, while the upper rail consists of a series of pyramided levels in two tracks which fit into matching cored grooves in the door frame. The rails are reinforced against severe impact with horizontal ribs, the upper one having cross ribs at intervals of $1^1/_2$ in. and $1^3/_4$ in.; the lower portion being cross-ribbed at less frequent intervals. Here, too, the hollow back (Fig. 3) saves weight with no loss of strength.

The customer claims that, since the necessary molds and tools were produced, the door frames and tracks can be turned out at a cost that makes sales possible in a competitive market with a saving to the user. Plastics, they report, are being used for these refrigerator display case door frames and rails in place of hard rubber because of the lightweight, permanence of form, appearance and stability of color. Although several sizes are now being molded additions will be made to the line as the need develops.

Luxury liner

(*Continued from page 38*) cocktail lounge paneled in a highly polished ebonized wood. The cove lighting effect in this room is enhanced by 8 panels of carved methyl methacrylate rods, 6 rods in each group, placed back of the bar and over the green leather upholstered banquettes. Illuminated from below, the clear plastic columns seem to draw up the light from its concealed source and to spill it through the carved portions.

More than 110 illuminated signs were needed to designate passenger spaces, elevators, exits and stairways. The travelling guides for the vertical mechanical indicators for the passenger elevators at each deck level are molded methyl methacrylate and the entire mechanism is protected by a curved sheet of the same colorless transparent plastic.

For a ship that accommodates 1202 passengers and a crew of 643, supplies were necessarily purchased in great quantities. One of the items on the long list is 750 electric fans. The blades of the bracket fans are made of a laminated plastic and, in many cases, in colors that blend with the decorative scheme of the particular room in which they are placed.

The fireproof, decorative and durable qualities of these many synthetic materials were of a definite advantage when the search was being made for new structural and decorative products that would meet the stringent requirements of the Maritime Commission's regulation. Conventional applications of plastics for such items as telephones and switch plates, perform practical functions throughout the liner.

Flexible, transparent Pollenex breathing guard of Monsanto cellulose acetate keeps out dust. Inset shows rear view of device with nose clips

Stop that sneeze!

(*Continued from page 54*) cold sufferers can avoid much of the discomfort accompanying a head cold by regular use of this ingenious device.

The Pollenex (above) is another practical product that is helping to relieve discomfort and alleviate sickness. This tiny article consists of a clear cellulose acetate frame cut to fit the contours of the nostrils. Upon this frame a screening of fine silk mesh is mounted. This mesh catches the offending dust and prevents it from reaching the sensitive areas. The flexible plastic is easily fabricated and formed to shape and by using special cements, the filter is firmly attached to the frame. Because the plastic is so light and inconspicuous, a person soon forgets that he is wearing the little device, except for the relief that it affords him. Occasional flushing with cold water clears the mesh and makes it ready for further use. The filtering device is provided with either head strap or clips which hold it in place without discomfort.

Light in the darkroom

(*Continued from page 43*) of attachment not only eliminated a cementing operation, but the socket is made foolproof against jarring and working loose.

The plastic filters provide a soft, even light that can be used for safe illumination in the photographic darkroom for developing and otherwise working different types of film and printing papers. These filters can be easily and quickly changed and can be handled with considerably more safety than glass. The red filter is used when orthochromatic film is processed. The use of any other colored light would ruin the film

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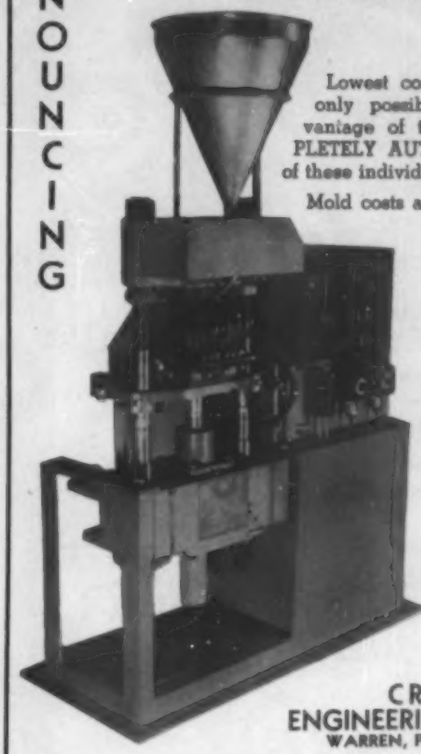

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Mold costs are as little as 10% of multiple mold investments, and the time saved allows deliveries to start weeks ahead of competition.

Keep your molding equipment well-rounded by a few of these self-contained presses that assure profit on special runs.

May we send our brochure or, preferably, may we cost analyze a job for you?

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HYDRAULIC VALVE

GREATER EASE AND FLEXIBILITY OF CONTROL

THE HIGHER THE PRESSURE THE TIGHTER THE VALVE

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as it is insensitive only to red light. The same idea holds true for the green filter. This is used when the very fast panchromatic type of film is being developed. In connection with this film, however, it should be noted that absolutely no kind of illumination is safe *until after development has started*. Only green can be used then, because all other colors including red are unsafe. The orange filter is safe when bromide enlargements are made, and when contact prints are made of slower papers, the yellow can be employed. Only the filters are changed in this lamp. The housing can remain attached to the dropcord or outlet at all times.

After various urea compounds were photo-spectrum tested in the laboratory for over six months, the proper colors were obtained.

Made entirely of heat-proof plastics, the Yankee Safe-Lite is not subject to warpage, nor is it affected by photographic chemicals which generally cause many materials to corrode. Both the plastics possess excellent di-electric properties and thus the unit may be handled with safety even when the hands are wet.

This darkroom lamp is sturdy, yet light in weight and can be set up quickly and inconspicuously in cramped quarters. It is said to be absolutely light-tight and is suitable for both amateur and professional work. Molding the lamp of plastics permitted a retail price approximately 50 percent lower than the price of lamps made of other materials.

Halo-hood dryers

(*Continued from page 39*) ciating the problems with which the molder was confronted, the customer adopted the suggestion for using smaller baffles within the rim of the part. It was discovered that the proper circulation of air would be obtained, as long as these louvers were at varying heights. Further, the mounting posts could be satisfactorily built so that they did not extend beyond the rim.

To assure a bubble-free, dirt-free molding, it was essential that the operator maintain absolute cleanliness in his press room, even more vital in this case than in the molding of I. E. S. lamp shades from urea compounds. To accomplish this, the raw material was weighed and bagged to the amount necessary for one part. The press, with a 340-ton capacity, was completely enclosed in a special room constructed for this particular job, and a veteran operator assigned to the task of meeting the meticulous requirements. The success of such precaution can readily be seen in the record which is reported to show less than 10 percent spoilage on a job in which the slightest bubble or dirt was cause for rejection.

According to the customer, the new machine designed as No. 7 hair dryer, is the result of more than a year's research, experimentation and development. Its many innovations in style and operation are designed to give the client the utmost in comfort, and the shop owner the best in service and speed. The transparency and

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10 East 40th St., New York, N. Y.

NOW... Get "Line Production" on Finish Operations

Reduce Hand-Work
Cut Costs 50%
with this

NEW
PORTER-CABLE
Wet Grinder Method!

Increase your output . . . put your plastic finishing on a "Line Production" basis—save spoilage waste. This *new* PORTER-CABLE Wet-Belt Sander-Grinder introduces a new method that insures speed-up . . . often 5 times faster and better than hand work. Stops plastic flow, heating, chipping, discoloring, fracturing and warping.

This PORTER-CABLE Sander-Grinder gives you cleaner, faster cutting on either straight or curved surfaces, on concave or convex areas—washes "fill-up" from abrasive belt—lengthens belt life 3 times. Grinds uniformly—straight grain finish without wavy surfaces. Fast, simple to operate. Write us *Today* about *Your* finish problems. Send samples. Let us help you get better finish at *lower cost*!

PORTER-CABLE MACHINE CO.
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YOU SERVE

A COLOR-CONSCIOUS *MARKET*

Combination and Single Purpose Instruments

Accuracy of color in plastics demands accuracy of molding temperatures. The Cambridge Mold Pyrometer is especially designed for checking temperatures of individual cavities in the plastic mold. It is an accurate instrument, rugged, quick and convenient to use. Its consistent use goes a long way in eliminating off-colors, soft centers, and warpage.

Cambridge Instrument Co., Inc.
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CAMBRIDGE
Surface—Needle—Mold
PYROMETERS

Bulletin 194—S gives details of these instruments. They help save money and make better plastics

CLASSIFIED

➡ **WANTED: Stainless Steel or Nickel Kettle, Vacuum Pan, Hydraulic Press, Preform Machine and Mixer. Reply Box 275, Modern Plastics. No Dealers.**

➡ **PLASTIC MIXING & MOLDING EQUIPMENT—Factory rebuilt—Hot Rolls or Mixing Mills, Hobbing and Die Sinking Presses, Semi-automatic and Standard Molding Presses, Hydraulic Pumps, Accumulators, Intensifiers. Reply Box 294, Modern Plastics.**

➡ **WANTED: To buy for cash your discontinued molds for compression or injection plastics. Give details—cavities, etc. Interested in any product—knobs, handles, cabinets—radio or display, electrical parts, grilles, buttons, novelties, etc. Also want finished articles, surplus or production items in Bakelite, Tenite, Lucite, Catalin, etc. Give quantities and prices. Reply Box 374, Modern Plastics.**

➡ **WANTED: A practical experienced production man for cast phenolic resins by a group with ample financial background interested in the production of plastics. Reply Box 375, Modern Plastics.**

➡ **FOR IMMEDIATE SALE: Semi-Automatic Hydraulic Presses, 5—300 Ton, 18″ Ram, 30″ x 25″ Platens, 2500 lbs.—1—175 Ton, 18″ Ram, 28″ x 24″ Platens, 1500 lbs.—1—250 Ton, 18″ Ram, 28″ x 24″ Platens, 2000 lbs.—11—125 Ton, 13″ Ram, 23″ x 17″ Platens, 2000 lbs. Large stocks Hydraulic Presses, Pumps, & Accumulators. Preform Machines, Rotary Cutters, Mixers, Grinders, Pulverizer, Tumbling Barrels, Drill Presses, Lathes, Gas Boilers, etc. Send for Bulletin #156 and #128. We also buy your surplus machinery for cash. Reply Box 378, Modern Plastics.**

➡ **FOR SALE: Colton #4½ single punch Tablet Machine, M.D.; Birm. 6″ x 12″ Lab. Rubber Mill, M.D.; 10—Semi-Auto. Presses, 75 to 400 ton, ejectors and pullbacks; 2—40″ Mixing Rolls; 4—Gould Triplex Hydraulic Pumps, 2—1500 PSI, 35 GPM, 2—3000 PSI, 18 GPM; 2—W.S. 4-cyl. opposed Hydraulic Pumps, 6000 PSI, 25 GPM, 100 HP motor drive; W.S. Hydro-Pneumatic Accumulator, 8″ ram, 48″ stroke, 42″ air cylinder, 5000 PSI; 3—24″ x 24″ Hydraulic Presses; 4″ Extruder; 7—W. & P. Mixers. Send for Complete List. Reply Box 385, Modern Plastics.**

➡ **PLASTIC ENGINEER: 37 years of age and married. Connected with one of the largest molders in the East. Electrical and mechanical technical training; extensive experience in injection molding, die design, complete building and setting up of hydraulic molding machines. Capable of taking full charge of tool-room and supervision of molding department. Reply Box 386, Modern Plastics.**

➡ **FOR SALE: #20 Banbury, complete with Potentiometer, timing device and lubricating system. Write for details. Reply Box 387, Modern Plastics.**

➡ **SELL TO THE CHAIN VARIETY STORES: Manufacturers' representative seeks additional lines to be sold to the major variety store chains. Twenty-four years of merchandising experience in this field and excellent contacts with the buyers of major chains assure high volume sales for a line of good items. Will sell and develop the line on a straight commission basis. Write Box 388, Modern Plastics.**

➡ **WANTED: Experienced production man to set up and take charge of plant to laminate with cellulose acetate material for cardboard and wood advertising novelties. Reply Box 389, Modern Plastics.**

➡ **FOR SALE: Surplus equipment, 4 hydraulic presses, 500 ton capacity; 4 hydraulic presses, 50 ton capacity; 4 pumps; other equipment. Reply Box 390, Modern Plastics.**

➡ **WANTED: Molding technician to take charge of small compression molding plant. Must have thorough knowledge of molds, equipment, materials, and design problems. Reply Box 391, Modern Plastics.**

delicate color of the molded part impart an air of coolness. In the addition to the new plastic front, the machine includes a new motor which is said to be remarkably quiet in operation. If, when the machine is on, a handkerchief is held within the hood, it will swirl around in a complete circle. This demonstration serves to show the purpose of the four ribs or baffles which are an integral part of the molded front. This scientifically directed flow of air is designed to dry the hair in the shortest possible time a reading lamp set in the metals hood directs light.

The manufacturer ships the hood with the plastic front as one piece, and although he has already sent out thousands, he reports that no damage has yet occurred in the shipping. The saving in weight is an important item in the shipping cost.

The new front makes it possible for the patron to see clearly all around her and feel perfectly relaxed while under the hood. That "hemmed-in" feeling is no more, instead she can now read or knit in comfort, or just "see what's going on." Beauty salon proprietors report that their customers are asking for this dryer. The dainty appearance of the plastic part gives no indication of its sturdy resiliency and toughness.

Sunshade and adapter

(*Continued from page 55*) number of cameras which may have different focal lengths.

Light weight and durability are two reasons why the manufacturer turned to plastics as the solution to his problem. Photographers, be they professional or amateur, like working with light materials, since they invariably carry around quite an assortment of gadgets in addition to the camera, and rugged wearing ability of the material is obviously an advantage.

It is interesting to note that the adapter ring on the molded model fits perfectly without the use of threading, which was not the case in the metal holder. But to assure the user of complete protection on this score, a tiny screw serves to clamp the ring even more tightly to the adapter. The possibility of any contraction or expansion of the plastic occurring at this point is practically nil, but, working on the theory of *safety first*, the small screw will ward off any difficulties.

These sunshades have been molded in six different sizes, varying a little in shape according to the size. The six sizes will cover a range of lens barrels from 21-mm. diameter to 45-mm. diameter.

But to return to our initial statement about cost. Probably of primary importance to the manufacturer is the fact that these adapters can be injection molded of plastic at a price that is ridiculously low when compared with the former production costs in metal. The retail sale price for the plastic sunshade and filter holder in any one of six sizes is $1.00 as compared with $1.50 to $5.00 for a metal adapter. So, through the use of plastics and the vision of the photographic supply manufacturers, the amateur or professional has a better product for less money.